**Pearson/Edexcel**

**GCSE (9-1) Mathematics (1MA1)**

**Problem-solving questions 4**

**Foundation Tier**

**Time: 1 hour 30 minutes**

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

Calculator permitted

Calculator not permitted in questions with \*

**1.** An advertising agency wants to run adverts on a television channel from Monday to Friday.

They want to run adverts from 4pm to 11pm.

The number of minutes of adverts in any half hour is 4 minutes.

An advert costs £1575 per minute.

Work out the cost of running these adverts from Monday to Friday.

**(Total for question 1 is 4 marks)**

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**2.** Sandeep wants to buy 20 cartons of juice.

**Shop B**

A carton of juice costs 60p

Get 4 for the price of 3

**Shop A**

A carton of juice costs 60p

20% off when you buy 10 or mare cartons of juice

Sandeep wants to spend the least amount of money.

In which shop should he buy the 20 cartons?

You must show your working.

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

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**3\*.** The diagram shows a rectangle *ABCD* and a triangle *DEF*.

*A*

*B*

*C*

*D*

*E*

*F*

*E* is the midpoint of *AB*.

*F* is the midpoint of *BC*.

*AB* = 12 cm

*BC* = 8 cm

Work out the area of the shaded triangle.

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

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**4\*.** Alexi grows oranges to make juice.

In May she made 9000 cartons of orange juice.

In June Alexi used 39 000 kg of oranges for juice.

She used 3 kg of oranges for every carton of juice.

In June Alexi made 4000 more cartons of juice than in May.

Is this correct?

You must show your working.

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

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**5\*.** A hotel has 30 bedrooms each with one door.

The manager wants to put 3 hooks on each of these bedroom doors.

The manager has 12 packets of hooks.

There are 8 hooks in each packet.

Does the manager have enough hooks?

You must show your working.

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

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**6\*.** Hannah wants new tiles for her bathroom.

She works out she needs a total of 600 tiles.

Hannah wants to use red tiles and blue tiles.

She is going to use 3 red tiles to every 7 blue tiles.

She will use more blue tiles than red tiles.

How many more?

**(Total for question 6 is 3 marks)**

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**7\*.** Rebecca buys *x* bars of chocolate.

Tim buys four times as many bars of chocolate as Rebecca.

Andrea buys three more bars of chocolate than Rebecca.

They have a total of 75 bars of chocolate.

Tim gives 3 of his bars of chocolate to Rebecca.

Andrea gives 5 of her bars of chocolate to Tim.

How many bars of chocolate does Tim have?

**(Total for question 7 is 5 marks)**

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**8.** Here is a set of four cards.

**4**

**15**

**12**

**5**

Another card is added to the set of four cards.

The mean increases by 5

Work out the value of the number on the card that has been added to the set of four cards.

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

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**9\*.** Nav is driving from Wolverhampton to London.

The total journey is 150 km.

Nav needs to be at his meeting for 9.50 am.

He leaves Wolverhampton at 8 am.

On the motorway there are roadworks for 30 km of the journey.

During the roadworks the average speed is 60 km/h.

For the rest of the journey the average speed is 80 km/h

Is Nav at the meeting for 9.50 am?

You must show your working.

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

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**10\*.** Mark drinks  of a litre of sparkling water every morning.

He drinks  of a litre of sparkling water every evening.

Sparkling water is sold in one litre bottles.

Work out the total number of bottles Mark needs to buy for one week.

You must show your working.

**(Total for question 10 is 4 marks)**

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**11\*.** The diagram shows a plan view of a wooden structure, *ABCDE*.

*A*

*B*

*C*

*D*

*E*

*ABDE* is a square with a perimeter of 20 m.

*BCD* is a triangle with a perimeter of 12 m.

David wants to put a metal strip all the way round the wooden structure, *ABCDE*.

The length of each metal strip is 3 m.

Work out the total number of metal strips that David needs.

You must show your working.

**(Total for question 11 is 4 marks)**

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**12\*.** Here are two boxes, **A** and **B**.

Each box contains some white marbles and some black marbles.

Box *B*

Box *A*

Tom says,

“The probability of picking at random a black marble from the box **A** is greater than the probability of picking at random a black marble from box **B**”,

Is Tom correct?

You must show your working.

**(Total for question 12 is 3 marks)**

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**13.** John sells bin liners on his market stall.

 of his bin liners are white.

35% of his bin liners are black.

The remaining 162 of his bin liners are green.

On Monday John sells 70% of the total number of his bin liners.

How many bin liners did John sell on Monday?

You must show your working.

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

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**14\*.** Jen has a children’s nursery in Amsterdam.

The table gives information about the ages of the children, the ratio of the number of teachers to the number of children needed and the number of children in each age group.

|  |  |  |  |
| --- | --- | --- | --- |
| Age | 1 | 2 | 3+ |
| Number of teachers : Number of children | 1 : 5 | 1 : 6 | 1 : 8 |
| Number of children | 10 | 15 | 22 |

Work out the minimum number of teachers Jen needs for her nursery.

You must show your working.

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

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**15\*.** *x* – 7 < 8 and *y* + 4 ≤ 3

*x* and *y* are integers.

Work out the greatest value of 2*x* + 3*y*.

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

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Foundation Problem Solving Questions – Mark schemes**

| **Qn** | **Answer** | **Mark** | **Notes** |
| --- | --- | --- | --- |
| **1** | £441 000 | 4 | P1 Process to work out the maximum minutes of adverts,  e.g. 7 × 2 × 4 (= 56)  P1 Process to work out the cost of adverts for one day or to work out the total time over 5 days,  e.g. “56” × 1575 (= 88200)  or “56” × 5 (= 280)  P1 Process to work the total cost for five days,  e.g. 5 × “88200” (= 441 000) “280” × 1575 (= 441 000)  A1 £441 000 |
| **2** | Shop B is cheaper and working | 3 | P1 Process to work out the cost of 20 cartons in shop A,  e.g. 0.8 × (20 × 60) (= 960)  or 0.8 × (20 × 0.60) (= 9.60)  P1 Process to work out the cost of cartons from shop B,  e.g. (20 ÷ 4 × 3) × 60 (= 9)  A1 Shop B is cheaper from accurate working |
| **3\*** | 36 | 3 | P1 Process to work out the area of rectangle *ABCD* or the area of triangles *ADE* or *EBF* or *CDF*,  e.g. 12 × 8 (= 96) or 6 × 8 ÷ 2 (= 24)  or 6 × 4 ÷ 2 (= 12) or 12 × 4 ÷ 2 (= 24)  P1 Process to work out the shaded area,  e.g. "96" − ("24" + "12" + "24") (= 36)  A1 36 |
| **4\*** | Yes with correct working | 3 | P1 Process to work out the number of cartons of juice in June, e.g. 39 000 ÷ 3 (= 13 000)  P1 Process to compare the number of cartons of juice,  e.g. “13 000” – 9000 (= 4000)  or 9000 + 4000 (= 13 000)  A1 Yes with 4000 seen or Yes with 13 000 seen |
| **5\*** | Yes with 90 and 96 | 3 | P1 Process to work out the number of hooks for the doors or the number of hooks the manager has,  e.g. 30 × 3 (= 90) or 8 × 12 (= 96)  P1 Process to work out the number of hooks for the doors and the number of hooks the manager has,  e.g. 30 × 3 (= 90) and 8 × 12 (= 96)  A1 for Yes and 90 and 96 seen |
|  |  |  | Alternative method  P1 12 × 8 (= 96)  P1 96/3 = 32  A1 Yes with 32 |
| **6\*** | 240 | 3 | P1 Process to work out the number of red tiles or blue tiles or the difference in ratios,  e.g.  × 600 (= 180) or  × 600 (= 420) or 7 – 3 (= 4)  P1 Process to work out the number of extra blue tiles,  e.g. “420”− “180” (= 240) or  × 600 (= 240)  A1 for 240 |
| **7\*** | 50 | 5 | P1 Process to set up an expression for the total number of bars of chocolates in terms of *x*,  e.g. *x* + 4*x* + *x* + 3 (= 6*x* + 3)  P1 Process to set up an equation in terms of *x*,  e.g. “6*x* + 3” = 75  P1 Process to solve the equation,  e.g. *x* = (75 – “3”) ÷ “6” (=12)  P1 Process to work out the number of chocolate for Tim,  e.g. (4 × “12”) – 3 + 5 (= 50)  A1 for 50 |
| **8** | 34 | 4 | P1 Process to work out the mean of the four numbers,  e.g. (12 + 15 + 4 + 5) ÷ 4 (= 9)  P1 Process to increase the mean, e.g. “9” + 5 (= 14)  P1 Process to work out the fifth number,  e.g. (“14” × 5) – “36” (= 34)  A1 for 34 |
| **9\*** | No and 2 | 4 | P1 Process to work out the time for the roadworks journey, e.g. 30 ÷ 60 (= 0.5 hours)  P1 Process to work out the time for the rest of the journey, e.g. (150 – 30) ÷ 80 (= 1.5 hours)  P1 Process to work out the total time for the journey,  e.g. “0.5” + “1.5” (= 2 hours)  A1 for No and 2 seen |
| **10\*** | 10 | 3 | P1 Process to work out the litres of water he drinks each day, e.g.  A1 for oe (=)  P1 Process to work out the litres of water he drinks in 7 days, e.g.  × 7 ()  A1 for 10 |
| **11\*** | 8 | 4 | P1 Process to work out the length *BAED* or *BCD*,  e.g. 20 – 5 (= 15) or 12 – 5 (= 7)  P1 Process to work out the perimeter of the wooden structure, e.g. “15” + “7” (= 22)  P1 Process to work out the number of lengths of metal strips needed, e.g. “22” ÷ 3 (= 7.333)  A1 for 8 |
| **12\*** | No and correct working | 3 | P1 Process to work out the probability of a black marble in box **A** or in box **B**,  e.g. or  P1 Process to compare probabilities,  e.g. “” and “” or “” and “”  or “0.6” and “0.7” or “60%” and “70%”  A1 for No and a correct set of probabilities seen |
| **13** | 252 | 4 | P1 Process to work out the proportion of green bin liners,  e.g. 100% − (20% + 35%) (=45%)  P1 Process to work out the total number of bin liners,  e.g. (162 ÷ “45” × 100) (= 360)  P1 Process to find the number of bin liners sold on Monday,  e.g. “360” × 0.7 (= 252)  A1 for 252 |
| **14\*** | 8 | 4 | P1 Process to find how many teachers are needed for one age group, e.g. 10 ÷ 5 or 15 ÷ 6 or 22 ÷ 8  P1 Process to find exact number of teachers needed for at least two groups, e.g. 10 ÷ 5 so 2 teachers or 15 ÷ 6 so 3 teachers or 22 ÷ 8 so 3 teachers  P1 For a complete process to find total number of teachers, e.g. “2” + “3” + “3” (must all be rounded up)  A1 for 8 |
| **15\*** | 25 | 4 | P1 Process to solve either inequality,  e.g. *x* < 8 + 7 (*x*<15) or *y* ≤ 3 − 4 (*x*≤−1)  P1 Process to identify the value of *x* and *y*,  e.g. (*x* =) “14” and (*y* =) “−1”  P1 Process to substitute *x* and *y* into the given expression,  e.g. 2 × “14” + 3 × “−1”  A1 for 25 |