🎓 MATHS TEACHER HUB

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Combinations

(9 – 1) Topic booklet

Higher

These questions have been collated from previous years GCSE Mathematics papers.

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

Total Marks

Instructions

•Use **black** ink or ball-point pen.
•**Fill in the boxes** at the top of this page with your name, centre number and candidate number.
•Answer **all** questions.
•Answer the questions in the spaces provided
 – *there may be more space than you need*.
•Diagrams are NOT accurately drawn, unless otherwise indicated.
•You must **show all your working out.**
•If the question is a **1H** question you are not allowed to use a calculator.
•If the question is a **2H** or a **3H** question, you may use a calculator to help you answer.

Information

•The marks for **each** question are shown in brackets
 – *use this as a guide as to how much time to spend on each question.*

Advice

•Read each question carefully before you start to answer it.
•Keep an eye on the time.
•Try to answer every question.
•Check your answers if you have time at the end.

Answer ALL questions
Write your answers in the space provided.
You must write down all the stages in your working.

11 Rayheem has

        16 shirts
        5 pairs of jeans
        3 jackets

Rayheem chooses an outfit to wear.
An outfit is 1 shirt, 1 pair of jeans and 1 jacket.

Work out how many different outfits Rayheem can choose.

$$16 \times 5 \times 3 = 240$$

240

June 2022 – Paper 3H   **(Total for Question 11 is 2 marks)**

11 Jack is in a restaurant.
There are 5 starters, 8 main courses and some desserts on the menu.

Jack is going to choose one starter, one main course and one dessert.
He says there are 240 ways that he can choose his starter, his main course and his dessert.

Could Jack be correct?
You must show how you get your answer.

$$5 \times 8 \times \square = 240$$

$$40 \times \square = 240$$

Jack could be correct if there are 6 desserts available.

November 2020 – Paper 2H   **(Total for Question 11 is 2 marks)**

2

11 Jeff is choosing a shrub and a rose tree for his garden.
    At the garden centre there are 17 different types of shrubs and some rose trees.

    Jeff says,

            "There are 215 different ways to choose one shrub and one rose tree."

    Could Jeff be correct?
    You must show how you get your answer.

$$17 \times \boxed{} = 215$$

$$\boxed{} = \frac{215}{17}$$

$$\boxed{} = 12 \cdot 6$$

deff is wrong, you cannot have a decimal number
of trees.

(Total for Question 11 is 2 marks)

12 Marie has 25 cards.
Each card has a different symbol on it.

Marie gives one card to Shelley and one card to Pauline.

(a) In how many different ways can Marie do this?

$$25 \times 24 = 600$$

600

(2)

There are 12 boys and 10 girls in David's class.
David is going to pick three different students from his class and write their names in a list in order.

The order will be

boy
girl
boy

or

girl
boy
girl
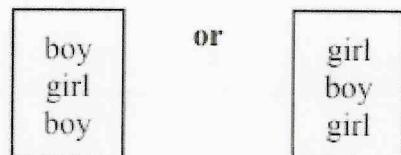
(b) How many different lists can David write?

$$12 \times 10 \times 11 = 1320$$

$$10 \times 12 \times 9 = 1080$$

$$1320 + 1080 = 2400$$

2400

(3)

(Total for Question 12 is 5 marks)

13 There are 30 students in a class.
A teacher is going to choose at random 2 of the students.

Work out the number of different pairs of students that the teacher can choose.

$$\frac{30 \times 29}{2} = \frac{870}{2}$$

435

(Total for Question 13 is 2 marks)

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13 There are 14 boys and 12 girls in a class.

Work out the total number of ways that 1 boy and 1 girl can be chosen from the class.

$$14 \times 12 = 168$$

168

(Total for Question 13 is 2 marks)

13 In a school there are 16 teachers and 220 students.
Of these students 120 are girls and 100 are boys.

One teacher, one girl and one boy are going to be chosen to represent the school.

Work out the number of different ways there are to choose one teacher, one girl and one boy.

$$16 \times 120 \times 100 = 192000$$

192000

(Total for Question 13 is 2 marks)

14 Sadia is going to buy a new car.
For the car, she can choose one body colour, one roof colour and one wheel type.

She can choose from
    19 different body colours
    25 different wheel types

The total number of ways Sadia can choose the body colour and the roof colour and the wheel type is 3325

Work out the number of different roof colours that Sadia can choose from.

$$19 \times 25 \times \square = 3325$$
$$475 \times \square = 3325$$
$$\square = \frac{3325}{475}$$
$$\square = 7$$

7

(Total for Question 14 is 2 marks)

14 There are 16 hockey teams in a league.
Each team played two matches against each of the other teams.

Work out the total number of matches played.

$$16 \times 15 = 240$$

240

(Total for Question 14 is 2 marks)

15 A pet shop has

7 guppy fish
13 tetra fish
5 angel fish.

David is going to choose one of the following combinations of fish

a guppy fish and an angel fish

or a tetra fish and an angel fish

or a guppy fish, a tetra fish and an angel fish.

Show that there are 555 different ways for David to choose his fish.

$$7 \times 5 = 35$$

$$13 \times 5 = 65$$

$$7 \times 13 \times 5 = 455$$

$$455 + 35 + 65 = 555$$

(Total for Question 15 is 2 marks)

15 Tracey is going to choose a main course and a dessert in a cafe.
She can choose from 8 main courses and 7 desserts.

Tracey says that to work out the number of different ways of choosing a main course and a dessert you add 8 and 7

(a) Is Tracey correct?
    You must give a reason for your answer.

No, there are 7 dessert options for each main course,   8 × 7 = 56 ways.

(1)

12 teams play in a competition.
Each team plays each other team exactly once.

(b) Work out the total number of games played.

$$\frac{12 \times 11}{2} = \frac{132}{2} = 66$$

66

(2)

(Total for Question 15 is 3 marks)

15 There are 17 men and 26 women in a choir.
The choir is going to sing at a concert.

One of the men and one of the women are going to be chosen to make a pair to sing the first song.

(a) Work out the number of different pairs that can be chosen.

$$17 \times 26 = 442$$

442

(2)

Two of the men are to be chosen to make a pair to sing the second song.

Ben thinks the number of different pairs that can be chosen is 136
Mark thinks the number of different pairs that can be chosen is 272

(b) Who is correct, Ben or Mark?
Give a reason for your answer.

$$\frac{17 \times 16}{2} = 136$$

Ben is correct

(1)

(Total for Question 15 is 3 marks)

16 There are three dials on a combination lock.
Each dial can be set to one of the numbers 1, 2, 3, 4, 5
The three digit number 553 is one way the dials can be set, as shown in the diagram.
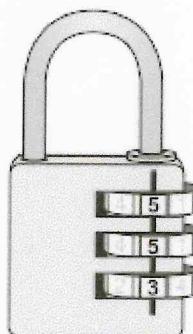
(a) Work out the number of different three digit numbers that can be set for the combination lock.

$$5 \times 5 \times 5 = 125$$

125

(2)

(b) How many of the possible three digit numbers have three different digits?

$$5 \times 4 \times 3 = 60$$

60

(2)

(Total for Question 16 is 4 marks)

19 The menu in a restaurant has starters, main courses and desserts.

There are 5 starters.
There are 12 main courses.
There are x desserts.

There are 420 different ways to choose one starter, one main course and one dessert.

Work out the value of x.

$$5 \times 12 \times \boxed{x} = 420$$
$$60 \times \boxed{x} = 420$$
$$\boxed{x} = 7$$

$x =$ _____ 7

(Total for Question 19 is 2 marks)