Probability 1 (H)

A collection of 9-1 Maths GCSE Sample and Specimen questions from AQA, OCR, Pearson-Edexcel and WJEC Eduqas.

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Total Marks:	

1. The village of Sumston is organising a Spring Fayre to raise money for the local community centre.

Prize	Toy	Pen	Pencil
Probability	x	$3x$	$16x$

(a) In the 'lucky dip', everyone wins either a toy or a pen or a pencil.

The probabilities of winning the different prizes are given in the following table.

Prize Toy Pen Pencil

Probability x 3x 16x

Find the value of x.

$$x + 3x + 16x = 1$$
$$20x = 1$$
$$x = \frac{1}{20} = 0.05$$

[2]

(b) In the raffle, a free second ticket is given with every ticket bought.

GRAND RAFFLE

Buy one ticket and get one free!!!

Stephen thinks this offer will double his chance of winning a prize.

Is Stephen correct?

You must explain your answer.

No. the probability of winning does not change as everyone gets a 2nd ticket

[1]

2. Dan believes he knows what his brother Ethan is thinking.
He carries out an experiment to test this.

Dan and Ethan sit back-to-back.
Ethan rolls an ordinary fair dice.

Ethan then thinks about the number on the dice while Dan tries to predict this number.

(a) In 300 attempts, how many correct predictions would you expect Dan to make if he was just guessing?

$\frac{1}{6} \times 300$

(a) ....50............ [2]

(b) The results of the first 15 attempts are shown in the table.

Ethan's number	2	6	5	3	2	1	5	1	3	4	4	6	1	6	5
Dan's prediction	2	4	3	1	2	6	1	6	4	3	2	6	5	2	3
Matching pair	✓				✓							✓			

Estimate the probability of getting a matching pair using the results of

(i) the first five attempts,

(b)(i) ....$\frac{2}{5}$............ [1]

(ii) all 15 attempts.

(ii) ....$\frac{3}{15} = \frac{1}{5}$............ [1]

(c) Use answers from (a) and (b) to comment on Dan's belief that he knows what Ethan is thinking.

The probability of guessing is $\frac{1}{6}$ in the first five it was $\frac{2}{5}$ and the first 15 it was $\frac{1}{5}$ but if they did more it would tend towards $\frac{1}{6}$ which is what would be expected so there is no evidence of Dans belief. [2]

3. A coin is rolled onto a grid of squares.

It lands randomly on the grid.

To win, the coin must land completely within one of the squares.

Meera and John each roll the coin a number of times and record their results.

	Number of wins	Number of losses	
Meera	6	44	50
John	28	72	100

(a) Work out two different estimates for the probability of winning.

Answer $\dfrac{6}{50}$ and $\dfrac{28}{100} = \dfrac{14}{50}$ [2]

(b) Which of your estimates is the better estimate for the probability of winning?

Give a reason for your answer.

Answer: $\dfrac{14}{50}$

Reason: There are more trials

[1]

4. Abi, Ben and Carl each drop a number of identical drawing pins, and count how many land with the pin upwards. The table shows some of their results.

	Number of pins dropped	Number landing 'pin up'	
Abi	10	4	$\dfrac{4}{10}$
Ben	30	9	$\dfrac{9}{30} = \dfrac{3}{10}$
Carl	100	35	$\dfrac{35}{100}$

(a) Abi says

As a drawing pin can only land with its pin up or with its pin down, the probability of a drawing pin landing 'pin up' is ½

Criticise her statement.

She is assuming it is equally likely to land pin up or pin down. and this isn't the case

[1]

(b) Carl's results give the best estimate of the probability of a drawing pin landing 'pin up'.

Explain why. There are more trials so the results are more reliable.

[1]

(c) Two pins are dropped.

Estimate the probability that both pins land 'pin up'.

using all results $8 \times \dfrac{48}{140} = \dfrac{2304}{19600}$

(a) $0.12 \ (2 \text{d.p.})$ [2]

5. There are only red counters, blue counters, green counters and yellow counters in a bag.

   The table shows the probabilities of picking at random a red counter and picking a random a yellow counter.

Colour	red	blue	green	yellow
Probability	0.24	0.22	0.22	0.32

The probability of picking a blue counter is the same as the probability of picking a green counter.
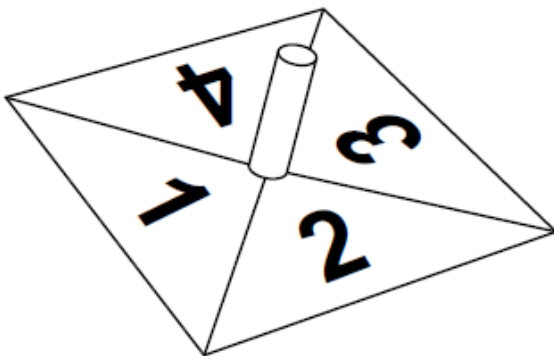
Complete the table.

$$0.32$$
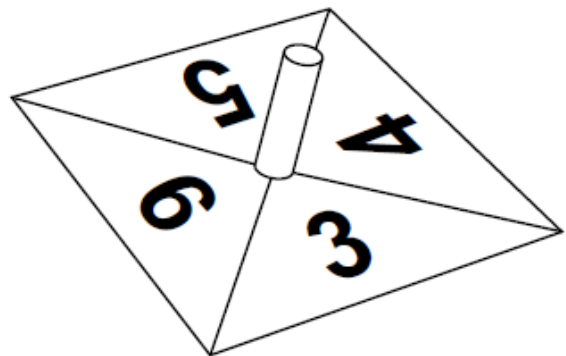$$\underline{0.24}$$
$$0.56$$

$$1 - 0.56 = 0.44$$
$$0.44 \div 2 = 0.22$$

[2]

6. Andrea has these two fair spinners.

Spinner A

Spinner B

a) Andrea spins spinner A.

   Calculate the probability that Andrea gets 2 with one spin.

   $$\frac{1}{4}$$

   a) .... [1]

b) Andrea now spins both spinners once.

   She adds the number she gets on spinner A to the number she gets on spinner B.

i) Andrea works out the probability that the two numbers she gets add to 4.

   Here is her working.

ways of making 4

1, 3

1 + 3 = 4   3 + 1 = 4

not possible

1,3	1,4	1,5	1,6
2 3	24	2,5	2,6
3,3	3,4	3,5	3,6
4,3	4,4	4,5	5,6

There are 4 outcomes on each spinner making ~~8~~ outcomes in total.

16

The probability of the two numbers adding to 4 is $\frac{2}{8} = \frac{1}{4}$.

Andrea has made some errors.

Describe these errors ① You cannot get 3+1 as there isn't a 1 on the 2nd spinner.

② there are 16 outcomes

③ $P(4) = \frac{1}{16}$

[2]

ii) Find the probability that the two numbers she gets add to 6.

$\frac{3}{16}$

b)(ii) .... [3]

7. The probability that a biased coin lands on heads is ~~$\frac{2}{4}$~~ $\frac{2}{3}$

The coin is spun twice.

Circle the probability of two heads.

$\frac{2}{9}$ $\frac{4}{6}$ $\boxed{\frac{4}{9}}$ $\frac{4}{3}$

[1]

8. Here is an ordinary dice.

(a) Ali is going to throw the dice six times.

He says, "I will get one of each number."

Give a reason why he could be wrong.

The number of rolls is too small for theoretical probability

[1]

(b) Lucy throws the dice 50 times.

Her results are shown.

Number thrown	1	2	3	4	5	6
Frequency	7	4	12	5	9	13

Work out the relative frequency of throwing an odd number.

$$7 + 12 + 9 \quad = \frac{28}{50}$$

[2]

9. Bag A contains 10 blue balls and 20 red balls.

Bag B contains 8 blue balls and 12 red balls.

$P(B) \quad \frac{10}{30}$

$P(R) = \frac{20}{30}$

A

B

$P(B) = \frac{8}{20}$

$P(R) = \frac{12}{20}$

A ball is chosen at random from each bag.

Jo says,

"It is more likely that a blue ball is chosen from Bag A than Bag B because there are more blue balls in Bag A."
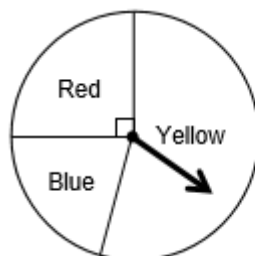
Is she correct? You must show your working.

$P(B) \text{ from } A = \frac{10}{30} = \frac{1}{3}$

$P(B) \text{ from } B = \frac{8}{20} = \frac{4}{10} = \frac{2}{5}$

Jo is wrong because $\frac{2}{5}$ is bigger than $\frac{1}{3}$

[3]

10. In a game, a fair spinner has three sections.

Not drawn accurately

Red

Yellow

Blue

a) Joe uses this method to work out the probability of getting two reds from two spins.

He writes: "There are three colours, so the probability of the spinner landing on red is $\frac{1}{3}$

$$\frac{1}{3} + \frac{1}{3} = \frac{2}{3}$$, so the probability is $\frac{2}{3}$

Make two criticisms of Joe's method.

Criticism 1 *The probability is not equally likely just because there are 3 colours P(Red) is actually $\frac{1}{4}$*

Criticism 2 *The probability of 2 reds is $\frac{1}{4} \times \frac{1}{4} = \frac{1}{16}$ (Joe had added the fractions)*

[2]

b) The probability of getting two blues from two spins is $\frac{1}{25}$

Work out the angle of the blue sector.

$P(B,B) = \frac{1}{25}$ so $P(B) = \frac{1}{5}$ Angle $= \frac{360}{5} = 72°$

[3]

11. A doctor claims that the probability of having regular illness is doubled if you have poor sleep rather than good sleep.

In a survey, 16% of people with poor sleep had regular illness.

Here are the results for people with good sleep.

Good Sleep

	Number of people
Regular illness	24
Not regular illness	276

300

Comment on the doctor's claim. You must show your working.

Probability of good sleep and regular illness $= \frac{24}{300} = \frac{8}{100} = 8\%$

The doctor is correct as 8% is half of 16%

[3]

12. John chooses a number at random from the digits 1 to 4

Matt also chooses a number at random from the digits 1 to 4

1, 1   1, 2, · 1 3   1 4
2 1   2 2   2 3   2 4
3 1   3 2   3 3   3 4
4 1   4 2   4 3   4 4

a) Write down the probability that the sum of the two numbers chosen is a two-digit number.

$P(\text{two digit number}) = \underline{0}$

[1]

b) Work out the probability that the product of the two numbers chosen is a two-digit number.

$4 \times 3 = 12$
$3 \times 4 = 12$
$4 \times 4 = 16$

$\dfrac{3}{16}$

[3]

CREDITS AND NOTES

Question	Awarding Body	Question	Awarding Body
1	WJEC Eduqas	9	AQA
2	OCR	10	AQA
3	AQA	11	AQA
4	OCR	12	AQA
5	Pearson Edexcel		
6	OCR		
7	AQA		
8	AQA		

Notes:

These questions have been retyped from the original sample/specimen assessment materials and whilst every effort has been made to ensure there are no errors, any that do appear are mine and not the exam board s (similarly any errors I have corrected from the originals are also my corrections and not theirs!).

Please also note that the layout in terms of fonts, answer lines and space given to each question does not reflect the actual papers to save space.

These questions have been collated by me as the basis for a GCSE working party set up by the GLOW maths hub - if you want to get involved please get in touch. The objective is to provide support to fellow teachers and to give you a flavour of how different topics "could" be examined. They should not be used to form a decision as to which board to use. There is no guarantee that a topic will or won't appear in the "live" papers from a specific exam board or that examination of a topic will be as shown in these questions.

Links:

AQA http://www.aqa.org.uk/subjects/mathematics/gcse/mathematics-8300

OCR http://ocr.org.uk/gcsemaths

Pearson Edexcel http://qualifications.pearson.com/en/qualifications/edexcel-gcses/mathematics-2015.html

WJEC Eduqas http://www.eduqas.co.uk/qualifications/mathematics/gcse/

Contents:

This version contains questions from:

AQA – Sample Assessment Material, Practice set 1 and Practice set 2

OCR – Sample Assessment Material and Practice set 1

Pearson Edexcel – Sample Assessment Material, Specimen set 1 and Specimen set 2

WJEC Eduqas – Sample Assessment Material