

High School Mathematics Test 2014

Year
9

Counting Techniques

Non Calculator

Skills and Knowledge Assessed:

- List all outcomes for two-step chance experiments, both with and without replacement using tree diagrams or arrays. Assign probabilities to outcomes and determine probabilities for events (ACMSP225)
- Calculate relative frequencies from given or collected data to estimate probabilities of events involving 'and' or 'or' (ACMSP226)

Name _____

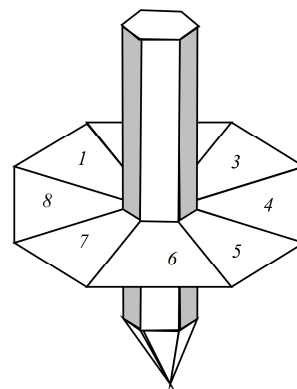
Section 1 Short Answer Section

Write all working and answers in the spaces provided on this test paper.

Questions 1 and 2 refer to the following:

Tim makes an octagonal spinner with equal sized sectors, numbered from 1 to 8.

Tim spins the spinner.



1. What is the probability that it stops on a number higher than 3?

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.....

2. What is the probability that it doesn't stop on a 6 or an 8?

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Questions 3 – 5 refer to the following:

Richard finds two tetrahedron dice which are both numbered 1 to 4.



3. Richard has started a table to show the outcomes from rolling the two dice. Complete the table.

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

4. What is the probability that both dice land on a 2?

.....

.....

5. What is the probability that the dice show different numbers?

.....

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Questions 6 and 7 refer to the following:

Adrian throws two normal coins.



6. Draw up a tree diagram to show the possible combinations of Heads and Tails.

7. What is the probability that both coins show a head?

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Questions 8 - 10 refer to the following:

Adrian suspects that a die is biased. To test this he rolls the die 80 times and records the results in the table below.

Number on Die	Frequency	Relative Frequency
1	8	
2	7	
3	13	
4	14	
5	20	
6	18	

8. Complete the relative frequency column on the table.

9. Based on the results of the experiment, explain why you agree or disagree with Adrian's suspicions.

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10. If a similar pattern as shown in the experiment were to continue, what is the probability of a five or a six on one roll of the die?

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Questions 11 – 13 refer to the following:

John is buying a car. He has the choice of a sedan, a hatchback or a wagon and he likes four colours; aqua, burgundy, cyan, and emerald.



11. Complete the table to show the possible combinations he can choose from.

	Sedan 	Hatch 	Wagon 
Aqua			
Burgundy			
Cyan			
Emerald			

12. If he chose one combination at random, what is the probability it would be a sedan or would be burgundy, but not both?

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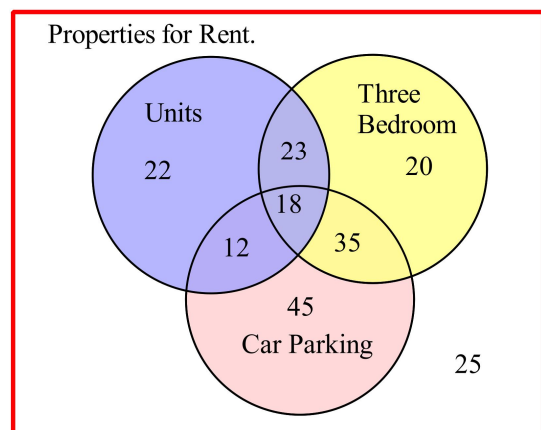
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13. John decided not to buy a wagon. What is the probability that the vehicle he chose is a hatch, or is burgundy or both?

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Questions 14 - 15 refer to the following:
The Venn Diagram summarises available rental properties in Chesterton.



14. What is the relative frequency of properties which have car parking available?

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15. If one of the units was chosen at random, what is the probability that it has three bedrooms and car parking?

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Calculator Allowed

Name _____

Section 2 Multiple Choice Section

Mark all your answers on the accompanying multiple choice answer sheet, not on this test paper. You may do any working out on this test paper. Calculators are allowed for this section.

Questions 1 and 2 refer to the following

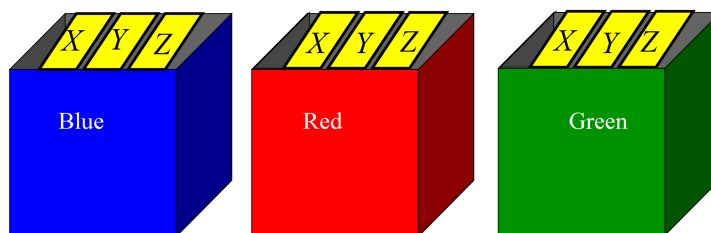
Xavier is asked to pick a weekday (Monday to Friday) in November for an appointment. He randomly chooses a weekday.

NOVEMBER 2014						
SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
						1
2	3	4	5	6	7	8
9	10	11	12	13	14	15
16	17	18	19	20	21	22
23	24	25	26	27	28	29
30						

1. How many outcomes are in the sample space?
 A. 15 B. 20 C. 25 D. 30
2. What is the probability that he picks a date before the 11th of November?
 A. $\frac{3}{10}$ B. $\frac{1}{3}$ C. $\frac{1}{2}$ D. $\frac{3}{5}$

Questions 3 – 5 refer to the following:

In a game show, you can choose a prize by first selecting one of three coloured boxes and choosing one of 3 prize cards from the box.



3. James is playing the game and starts to list the possible outcomes.

BX, BY, RX, RZ, GY, GZ

What is missing from the list?

- A. BX, RY, GZ B. BY, RZ, GX C. BZ, RY, GX D. BX, RZ, GY

4. What is the probability of selecting a Y card from the Red or Green boxes?

- A. $\frac{1}{9}$ B. $\frac{2}{9}$ C. $\frac{1}{3}$ D. $\frac{2}{3}$

5. What is the probability that an X card from the Blue or Green boxes is not selected?

- A. $\frac{2}{9}$ B. $\frac{4}{9}$ C. $\frac{2}{3}$ D. $\frac{7}{9}$

Questions 6 and 7 refer to the following:

Maisie's sandwich stall has a limited number of options. You can have a sandwich on either white or grain bread and you have a choice of beef, chicken, ham or salad as a filling. A table has been started to show the possible combinations.

	White	Grain
Beef	WB	GB
Chicken	WC	
Ham		
Salad		

Carrie chooses a sandwich combination at random.



6. What is the probability that she gets a sandwich with ham or chicken?

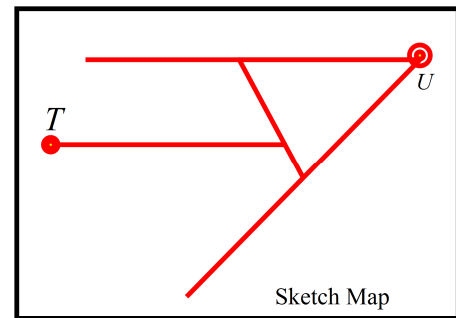
- A. $\frac{1}{4}$ B. $\frac{3}{8}$ C. $\frac{1}{2}$ D. $\frac{5}{8}$

7. What is the probability that her sandwich is on white bread or has beef as a filling or both?

- A. $\frac{1}{4}$ B. $\frac{3}{8}$ C. $\frac{1}{2}$ D. $\frac{5}{8}$

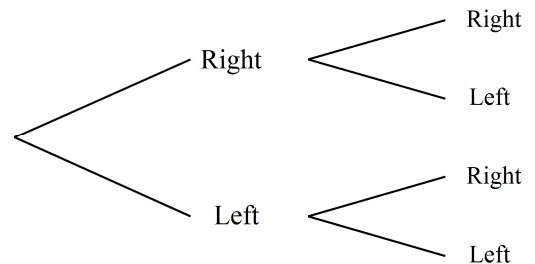
Questions 8 – 10 refer to the following.

Tim was riding his bike to Ursula's house. On the way, Tim came to two T intersections, where he could turn only right or left. The sketch map shows the streets.



Tim forgot the instructions on how to get there, so he randomly chose the direction he would turn at each intersection.

The tree diagram shows the possible combinations of turns he could take.



8. What is the probability that he turned left and then right?

A. $\frac{1}{4}$ B. $\frac{1}{3}$ C. $\frac{1}{2}$ D. $\frac{3}{4}$

9. What is the probability that at least one of his turns was left?

A. $\frac{1}{4}$ B. $\frac{1}{3}$ C. $\frac{1}{2}$ D. $\frac{3}{4}$

10. What is the probability that he got to Ursula's house with just two turns?

A. $\frac{1}{4}$ B. $\frac{1}{3}$ C. $\frac{1}{2}$ D. $\frac{3}{4}$

Questions 11 and 12 refer to the following:

The two way table shows the types of window available from a manufacturer and the number of each type sold in the last week.

	Smoky Glass	Clear Glass	Total
Timber Frame	7	11	18
Metal Frame	13	19	32
Total	20	30	

11. A window which came from the company last week is chosen at random. What is the probability that it has a timber frame and smoky glass?

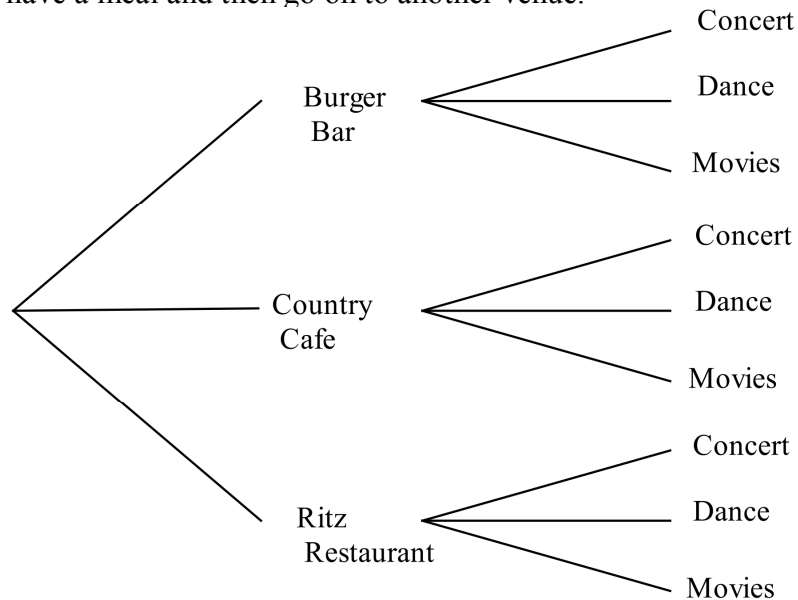
A. 0.07 B. 0.14 C. 0.22 D. 0.30

12. A smoky glass window is chosen at random from those made last week. What is the probability that it has a metal frame?

A. 0.13 B. 0.26 C. 0.35 D. 0.65

Questions 13 – 15 refer to the following:

The tree diagram below shows the possible choices that Dylan's girl friend gives him for their date on Friday. They will have a meal and then go on to another venue.



Dylan decides to randomly choose one of the options.

13. What is the probability that they will go to the Country Café and either a concert or dance?

A. $\frac{2}{9}$ B. $\frac{1}{3}$ C. $\frac{4}{9}$ D. $\frac{2}{3}$

14. What is the probability that they don't go to the Ritz Restaurant nor to the movies?

A. $\frac{1}{9}$ B. $\frac{2}{9}$ C. $\frac{4}{9}$ D. $\frac{2}{3}$

15. If Dylan decides he definitely won't go to the movies, what is the probability that they will go to the Country Café or to a concert or both?

A. $\frac{1}{3}$ B. $\frac{4}{9}$ C. $\frac{1}{2}$ D. $\frac{2}{3}$

High School Mathematics Test 2014

Counting Techniques

Multiple Choice Answer Sheet

Name _____

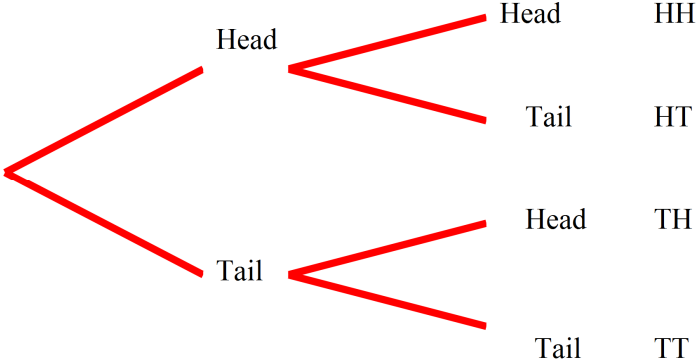
Completely fill the response oval representing the most correct answer.










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| 1. | A | <input type="radio"/> | B | <input type="radio"/> | C | <input type="radio"/> | D | <input type="radio"/> |
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| 6. | A | <input type="radio"/> | B | <input type="radio"/> | C | <input type="radio"/> | D | <input type="radio"/> |
| 7. | A | <input type="radio"/> | B | <input type="radio"/> | C | <input type="radio"/> | D | <input type="radio"/> |
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| 15. | A | <input type="radio"/> | B | <input type="radio"/> | C | <input type="radio"/> | D | <input type="radio"/> |

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ANSWERS

Section 1 (1 mark each)						
	Working and Answers					
1.	The numbers higher than 3 are 4,5,6,7,and 8. $P(\text{ Higher than 3}) = \frac{5}{8}$					
2.	$P(\text{Not 6 or 8}) = \frac{6}{8} = \frac{3}{4}$					
3.			1	2	3	4
		1	1,1	1,2	1,3	1,4
		2	2,1	2,2	2,3	2,4
		3	3,1	3,2	3,3	3,4
		4	4,1	4,2	4,3	4,4
4.	$P(\text{Both 2}) = \frac{1}{16}$					
5.	$P(\text{Different}) = 1 - P(\text{SAme})$ $= 1 - \frac{1}{4}$ $= \frac{3}{4}$					
6.						
7.	$P(\text{HH}) = \frac{1}{4}$					

8.	<table><tr><th>Number on Die</th><th>Frequency</th><th>Relative Frequency</th></tr><tr><td>1</td><td>8</td><td>$\frac{8}{80} = 0.1$</td></tr><tr><td>2</td><td>7</td><td>$\frac{7}{80} = 0.0875$</td></tr><tr><td>3</td><td>13</td><td>$\frac{13}{80} = 0.1625$</td></tr><tr><td>4</td><td>14</td><td>$\frac{14}{80} = 0.175$</td></tr><tr><td>5</td><td>20</td><td>$\frac{20}{80} = 0.25$</td></tr><tr><td>6</td><td>18</td><td>$\frac{18}{80} = 0.225$</td></tr></table>	Number on Die	Frequency	Relative Frequency	1	8	$\frac{8}{80} = 0.1$	2	7	$\frac{7}{80} = 0.0875$	3	13	$\frac{13}{80} = 0.1625$	4	14	$\frac{14}{80} = 0.175$	5	20	$\frac{20}{80} = 0.25$	6	18	$\frac{18}{80} = 0.225$
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9.	The results would tend to support Adrian’s suspicions, as the higher numbers (5 and 6) have a much higher relative frequency than the lower ones. The number of throws is reasonably large, so should start to even out if it were unbiased. (Any valid answer if supported by data)																					
10.	Probability of a five or six is 38 out of 80 = $\frac{19}{40} = 0.25 + 0.225 = 0.475$																					
11.	<table><tr><td></td><td><div>Sedan</div></td><td><div>Hatch</div></td><td><div>Wagon</div></td></tr><tr><td>Aqua</td><td>AS</td><td>AH</td><td>AW</td></tr><tr><td>Burgundy</td><td>BS</td><td>BH</td><td>BW</td></tr><tr><td>Cyan</td><td>CS</td><td>CH</td><td>CW</td></tr><tr><td>Emerald</td><td>ES</td><td>EH</td><td>EW</td></tr></table>		<div>Sedan</div> 	<div>Hatch</div> 	<div>Wagon</div> 	Aqua	AS	AH	AW	Burgundy	BS	BH	BW	Cyan	CS	CH	CW	Emerald	ES	EH	EW	
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Cyan	CS	CH	CW																			
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12.	$P(\text{ S or B not both}) = \frac{5}{12}$																					
13.	Excluding wagons, $P(\text{ H or B or both}) = \frac{5}{8}$																					
14.	Total properties = 200 Properties with Parking =110 Relative frequency = $\frac{110}{200} = \frac{11}{20} = 0.55$																					
15.	Number of units = 75 Units with 3 BR and Parking = 18 $P(3 \text{ br and cp given unit}) = \frac{18}{75} = \frac{6}{25}$																					

Section 2 (1 mark each)																		
	Working			Answers														
1.	There are 30 days, of which 5 are Sat and 5 are Sun so 20 are weekdays. Sample space has 20 outcomes.			B														
2.	6 weekdays before the 11 th . $P(\text{Before 11th}) = \frac{6}{20} = \frac{3}{10}$			A														
3.	Full set is BX, BY, BZ , RX, RY , RZ, GX , GY, GZ So missing are BZ, RY, GX.			C														
4.	1 Y card in each box, so 2 ways altogether $P(\text{BY or GY}) = \frac{2}{9}$			B														
5.	1 X card in each box, so 2 ways to select from B or G. So 7 ways to not select. $P(\text{BX or GX}) = \frac{7}{9}$			D														
6.	4 comb have H or C. $P(\text{H or C}) = \frac{4}{8} = \frac{1}{2}$	<table><tr><td></td><td>White</td><td>Grain</td></tr><tr><td>Beef</td><td>WB</td><td>GB</td></tr><tr><td>Chicken</td><td>WC</td><td>GC</td></tr><tr><td>Ham</td><td>WH</td><td>GH</td></tr><tr><td>Salad</td><td>WS</td><td>GS</td></tr></table>		White	Grain	Beef	WB	GB	Chicken	WC	GC	Ham	WH	GH	Salad	WS	GS	C
	White	Grain																
Beef	WB	GB																
Chicken	WC	GC																
Ham	WH	GH																
Salad	WS	GS																
7.	5 have either White or beef or both. $P(\text{W or C or both}) = \frac{5}{8}$			D														
8.	$P(\text{L then R}) = \frac{1}{4}$			A														
9.	All but one have a left. $P(\text{at least one L}) = \frac{3}{4}$			D														
10.	To reach Ursula's you need LR or RL. $P(\text{RL or LR}) = \frac{2}{4} = \frac{1}{2}$			C														
11.	Total windows last week = 50 Windows with timber frame and smoky glass = 7 $P(T \text{ and } S) = \frac{7}{50} = 0.14$			B														
12.	Total SG windows last week = 20 SG windows with metal frame = 13 $P(M \text{ given SG}) = \frac{13}{20} = 0.65$			D														
13.	There are 9 possible combinations. 2 meet the criteria $P(\text{Concert or Dance after Cafe}) = \frac{2}{9}$			A														
14.	$P(\text{not Ritz and not movies}) = \frac{4}{9}$			C														
15.	$P(\text{Concert or Cafe given not movies}) = \frac{4}{6} = \frac{2}{3}$			D														

High School Mathematics Test 2014

Counting Techniques

Multiple Choice Answer Sheet

Name Marking Sheet

Completely fill the response oval representing the most correct answer.

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| 1. | A | <input type="radio"/> | B | <input checked="" type="radio"/> | C | <input type="radio"/> | D | <input type="radio"/> |
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