



Year 8 Maths – Probability and Statistics



Level 1 Questions	Level 2 Questions	Level 3 Questions	Challenge Questions
<p>These question types represent the minimum requirements of the course. They are easier questions, normally with only one rule being applied at any time, they are mostly single step questions. These question types represent the minimum passing level for the course, a C level.</p>	<p>These questions represent a level of understanding above the minimum and often require more than one rule to be applied in a multi-step approach. The starting point or the approach to the question is not as clear. These question types represent a level of understanding at about the B level.</p>	<p>These questions represent of understanding well above what is required. They are questions with multiple steps and often with a range of different skills and thought processes embedded. The starting point is generally not given and may not even be clear as is the approach. These question types represent a level of understanding at about the A level.</p>	<p>Challenge questions appear at the end of the booklet. These questions can be very difficult and often require a range of different skills and thinking. They are questions where you need to think “out of the box” Other than knowing the questions are based on the current terms work you are given no indication of where to start or how to approach it.</p>

Simple Probability (Any 3 Questions – Including all Question Parts)

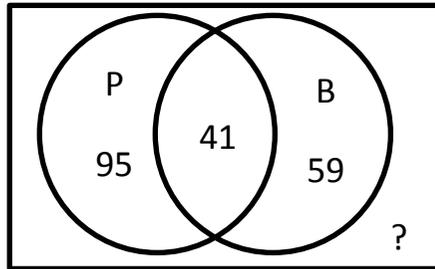
Level 1	Level 2	Level 3																																																								
<p>1. One card is drawn at random from a pack of playing cards. What is the probability that the card is:</p> <p>a) an Ace? b) a red card c) a Heart d) a picture card (K, Q or J)</p> <p>2. One counter is picked at random from a bag containing 15 red counters, 5 white counters and 5 yellow counters. What is the probability that the counter removed is:</p> <p>a) red? b) yellow? c) not red?</p> <p>3. A spinner is divided into 8 equal sections with sections labelled 1 to 8. Determine the probability of the following events.</p> <p>a) Pr(4) b) Pr(5) c) Pr(not 5) d) Pr(6 or 7) e) Pr(1 or 2) f) Pr(<3) g) Pr(≥4) h) Pr(<6)</p>	<p>1. A whole number is chosen from the first 30 positive whole numbers. What is the probability it is</p> <p>a) divisible by 5 b) divisible by 3 and 5? c) divisible by 5 but not 3? d) even and divisible by 5?</p> <p>2. For a bucket of coloured jelly beans it is known that Pr(green)=0.2, Pr(red)=0.3, Pr(purple)=0.2, Pr(yellow)=0.1 and Pr(white)=0.2. Find the following probabilities</p> <p>a) Pr(red or purple) b) Pr(yellow or white) c) Pr(not yellow or white) d) Pr(not green or red)</p> <p>3. For a six sided die, describe how you would colour the sides so that:</p> <p>a) Pr(white)=1/2, Pr(blue)=1/3, Pr(red)=1/6 b) Pr(red) = Pr(green) = 1/3, Pr(yellow) = Pr(white) = 1/6</p>	<p>1. A bag contains 1000 balls, some of which are red, some blue and the rest yellow. The probability of drawing a red ball is 1/25 and the probability of drawing a yellow ball is 7/20. Find:</p> <p>a) the number of yellow balls b) the number of blue balls c) the number of yellow balls that need to be removed to make the probability of red 1/20 d) the number of yellow balls (from the original 1000) that need to be removed so that the probability of drawing yellow is 1/6.</p> <p>2. A scrabble set consists of 100 pieces, 98 of which have a letter of the alphabet written on them, and two that are blank, the distribution of letters is as follows:</p> <table border="1" style="margin: 10px auto; border-collapse: collapse; text-align: center;"> <tr><td>A</td><td>B</td><td>C</td><td>D</td><td>E</td><td>F</td><td>G</td><td>H</td><td>I</td><td>J</td><td>K</td><td>L</td><td>M</td><td>N</td></tr> <tr><td>9</td><td>2</td><td>2</td><td>4</td><td>12</td><td>2</td><td>3</td><td>2</td><td>9</td><td>1</td><td>1</td><td>4</td><td>2</td><td>6</td></tr> <tr><td>0</td><td>P</td><td>Q</td><td>R</td><td>S</td><td>T</td><td>U</td><td>V</td><td>W</td><td>X</td><td>Y</td><td>Z</td><td colspan="2">Blank</td></tr> <tr><td>8</td><td>2</td><td>1</td><td>6</td><td>4</td><td>6</td><td>4</td><td>2</td><td>2</td><td>1</td><td>2</td><td>1</td><td colspan="2">2</td></tr> </table> <p>a) Why do you think the letters differ so much? b) Find the probability the first tile selected is i) blank ii) an O iii) a R iv) a vowel c) You are selecting letters from the bag and the tiles you pick out are your first name (in order)</p> <p>3. Draw a spinner for each of the following situations a) Pr(green) = Pr(orange) = Pr(blue) = 1/3 b) Pr(red) = 3xPr(blue) and Pr(green) = 1/5 c) Pr(brown) = 5xPr(green), Pr(red) = 3xPr(green) and Pr(yellow) = Pr(green)</p>	A	B	C	D	E	F	G	H	I	J	K	L	M	N	9	2	2	4	12	2	3	2	9	1	1	4	2	6	0	P	Q	R	S	T	U	V	W	X	Y	Z	Blank		8	2	1	6	4	6	4	2	2	1	2	1	2	
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Venn Diagrams and Two Way Tables (Any 3 Questions – Including all Question Parts)

Level 1	Level 2	Level 3																
<p>1. The patrons in a cinema each receive a numbered ticket when entering. The following two-way table describes the audience in terms of the categories Child-Adult and Male-Female. A ticket is drawn at random from a hat. The winner will receive free popcorn and soft drink.</p> <table border="1" style="margin: 10px auto; border-collapse: collapse; text-align: center;"> <thead> <tr> <th style="width: 15%;"></th> <th style="width: 15%;">Male</th> <th style="width: 15%;">Female</th> <th style="width: 15%;">Total</th> </tr> </thead> <tbody> <tr> <td>Child</td> <td>15</td> <td>23</td> <td>38</td> </tr> <tr> <td>Adult</td> <td>24</td> <td>30</td> <td>54</td> </tr> <tr> <td>Total</td> <td>39</td> <td>53</td> <td>92</td> </tr> </tbody> </table> <p>What is the probability that the number drawn is held by:</p> <p>a) a male? b) a female? c) a child? d) a male child? e) a female adult?</p> <p>2. Consider the experiment of rolling a fair six-sided die. Let A be the event 'an even number is rolled'. Let B be the event 'a number less than 3 is rolled'. Illustrate this with a Venn diagram</p>		Male	Female	Total	Child	15	23	38	Adult	24	30	54	Total	39	53	92	<p>1. A shopkeeper found that, out of his first 20 customers, 13 bought milk and 15 bought a newspaper. Four customers bought neither milk nor a newspaper.</p> <p>a) Represent this information as a two way table</p> <p>b) How many customers bought both milk and a newspaper</p> <p>c) Find the probability that a customer, chosen at random from the first 20:</p> <p style="margin-left: 40px;">i) bought milk only ii) bought milk and a newspaper iii) bought milk or a newspaper iv) did not buy a newspaper</p> <p>2. A number is chosen at random from the numbers 1, 2, 3 ..., 30. Let A be the event 'the number chosen is a multiple of 3' and B be the event 'the number chosen is greater than 23'. Illustrate with a Venn diagram.</p> <p>a) What percentage of the numbers satisfy both events A and B?</p> <p>b) What percentage of the numbers meet only one of the two events?</p>	<p>1. A three digit number is chosen at random</p> <p>a) draw a Venn diagram showing the quantity of numbers divisible by 3, 5 and 7</p> <p>b) Find the probability that the number is divisible by</p> <p style="margin-left: 40px;">i) 5 ii) 7 iii) 3 iv) 5 and 7 v) 5 or 7 vi) 3 and 5 and 7 vii) 3 and 5 but not 7 viii) 5 and 7 but not 3 ix) 3 or 5 or 7</p> <p>2. In a school of 650 everybody studies French (F), German (G) or Indonesian (I).</p> <ul style="list-style-type: none"> • All but 41 study French • 12 study French and Indonesian but not German. • 13 study Indonesian and German but not French and the same number study German only. • Twice as many study French and German but not Indonesian as study all three. • The number studying Indonesian only is the same as the total studying both French and German. <p>What is the probability that a student chosen at random studies French only?</p>
	Male	Female	Total															
Child	15	23	38															
Adult	24	30	54															
Total	39	53	92															

Level 1

3. A sample of 200 people was surveyed as to their access to pay TV (P) and broadband internet (B). The results are shown in the Venn diagram. If a person is chosen at random from those surveyed find:



- Pr(they have access to pay TV)
- Pr(they have broadband but not pay TV)
- Pr(They have access to neither of the two technologies.
- Pr(They have access to pay TV given that they have access to broadband internet)
- Pr(they have access to broadband internet given that they have access to pay TV)

Level 2

3. A survey of 150 people was carried out to determine eye colour and gender. The results are shown in the table.

	Male	Female
Blue	20	40
Brown	25	35
Green	15	15

What is the probability of a person chosen at random:

- having blue eyes?
- being male?
- being male and not having blue eyes?
- being female and not having blue eyes?
- being female or having blue eyes?
- being male or not having green eyes?

Level 3

3. A mouse breeder has 18 white and 12 brown mice. Of the 14 males, 10 are white.

- Construct a two-way table showing this information

Use the table to answer the following questions. Find the probability

- a mouse selected at random is white?
- a mouse selected at random is male?
- a mouse selected at random is a brown female?
- a white mouse is selected given that it is male?
- a female mouse is selected given that it is brown?

Measures of Central Tendency (Any 2 questions – Including all Question Parts)

Level 1	Level 2	Level 3
<p>1. Rohan recorded the points he won in a board game he played with several of his friends. The points he earned in the last 15 games are listed below. Find the mean, median and mode of this data set.</p> <p style="text-align: center;">23, 37, 42, 36, 45, 52, 25, 65, 47, 37, 54, 36, 50, 48, 33</p>	<p>1. a) For each of the following data sets calculate the mean, median and mode</p> <p>Set 1: 8, 9, 9, 10, 10, 10, 10, 10, 14, 15, 16, 18, 19, 20, 22</p> <p>Set 2: 1, 9, 9, 10, 10, 10, 10, 10, 14, 15, 16, 18, 19, 20, 22</p> <p>b) What effect did the change of data values from Set 1 to Set 2 have on each of the sample statistics you have calculated?</p> <p>c) Describe the effect of outliers of each of the measures of centre.</p>	<p>1. Construct a data set of at least 20 data points that satisfies the following criteria</p> <p>a) median < mean < mode b) median < mode < mean c) explain the importance, if any, of one or more outliers in making these data sets.</p>
<p>2. In the 2009 NRL season, the Manly-Warringah team, in all games including the finals, scored the following points.</p> <p style="text-align: center;">12, 24, 10, 12, 23, 24, 12, 8, 22, 34, 17, 38, 20, 20, 19, 18, 32, 44, 18, 22, 44, 20, 18, 38, 12</p> <p>a) Calculate the mean and median number of points scored for the season.</p> <p>b) Which of these statistics better represents their scores for the season?</p>	<p>2. The following data set appears to have two outliers, one at the start of the data sand one at the end. Outliers can have an effect on measures of the centre, specifically the mean.</p> <p style="text-align: center;">3, 10, 12, 12, 14, 14, 15, 16, 17, 18, 18, 19, 28</p> <p>a) Calculate the mean, median and mode of the data set.</p> <p>b) Change the 3 to 10 and the 28 to 19 and recalculate the mean, median and mode.</p> <p>c) What conclusions can you draw from your calculations?</p>	<p>2. A growth chart for boys aged 13 years indicates that 95% of them will be less than 169cm, 90% less than 166.5, 75% less than 163, 50% less than 157, 25% less than 151, 10% less than 147 and 5% less than 143.</p> <p style="text-align: center;">149, 147, 159, 167, 171, 177, 155, 180, 160, 170, 173, 166, 162, 150, 155, 169, 155, 179, 160, 161, 172, 155, 149, 154, 150, 168, 151, 171, 152, 141, 171, 156, 168, 155, 156, 158, 161, 160, 159, 168</p> <p>a) You are given the following set of heights and told that they are from boys of the same approximate age. Do you believe these boys are 13 year olds? Give clear reasons for your answer.</p> <p>b) A random sample of eight values was chosen from this data, these values are 160, 155, 171, 168, 177, 159, 160 and 161</p> <p>i) find the mean, median and mode of this sample.</p> <p>ii) Which statistic do you think is the best measure of centre? Give clear reasons for your choice.</p>

Challenge Questions

1. Weather records for July 2010 in Sydney showed that the month had no hot, calm, dry days. Of the 31 days, 7 were wet and cold but not windy, 4 were wet and windy but not cold, 8 were cold and windy but dry. 16 days were windy, 22 were cold and 2 were wet but not cold or windy. If a day is chosen at random, what is the probability that the day was cold but calm and dry?
2. A bag contains 120 balls, some of which are red and the rest black. The probability of a ball, drawn at random, being red is $\frac{2}{15}$. Find: the number of red balls that should be added to the bag to change the probability of obtaining a red ball to $\frac{1}{2}$.
3. A box contains 3 black and 1 yellow ball. A second box contains 2 black and 2 yellow balls. A ball is taken from the first box and put in the second. A ball is then withdrawn from the second box. Find the probability that the ball taken from the second box is yellow.
4. A teacher presents three problems to a class. 60%, 40% and 55% solve problems 1, 2 and 3 respectively. Also,
 - 15% solve the first 2 problems but not the third
 - 35% solve only the first and third problems
 - 15% solve only the last 2 problems
 - 5% solve all three.

A student is chosen at random. What is the probability that they solve none of the problems