

- 3** A factory produces a certain type of electrical component. It is known that 15% of the components produced are faulty. A random sample of 200 components is chosen.

Use an approximation to find the probability that more than 40 of these components are faulty. [5]

[illegible]

Use an approximation to find the probability that, of the 120 voters, between 36 and 54 inclusive voted for Anil. [5]

[illegible]

- 3 A farmer sells eggs. The weights, in grams, of the eggs can be modelled by a normal distribution with mean 80.5 and standard deviation 6.6. Eggs are classified as small, medium or large according to their weight. A small egg weighs less than 76 grams and 40% of the eggs are classified as medium.

(a) Find the percentage of eggs that are classified as small. [3]

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(b) Find the least possible weight of an egg classified as large. [3]

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- (c) Use an approximation to find the probability that more than 68 of these eggs were classified as medium. [5]

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- 5 The lengths of Western bluebirds are normally distributed with mean 16.5 cm and standard deviation 0.6 cm.

A random sample of 150 of these birds is selected.

- (a) How many of these 150 birds would you expect to have length between 15.4 cm and 16.8 cm? [4]

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The lengths of Eastern bluebirds are normally distributed with mean 18.4 cm and standard deviation σ cm. It is known that 72% of Eastern bluebirds have length greater than 17.1 cm.

- (b) Find the value of σ . [3]

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A random sample of 120 Eastern bluebirds is chosen.

- (c) Use an approximation to find the probability that fewer than 80 of these 120 bluebirds have length greater than 17.1 cm. [5]

1 30% of the residents of Wimfield own an electric car. Three residents are chosen at random.

- (a) Find the probability that either all three own an electric car or none of them owns an electric car. [2]

A series of horizontal lines for handwriting practice, consisting of a solid top line, a dashed middle line, and a solid bottom line. A large, light gray watermark reading 'twinkl.com' is oriented diagonally across the page.

A random sample of 125 of the residents of Wimfield is selected.

- (b) Use a suitable approximation to find the probability that more than 45 of these residents own an electric car. [5]

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- 2** The residents of Persham were surveyed about the reliability of their internet service. 12% rated the service as 'poor', 36% rated it as 'satisfactory' and 52% rated it as 'good'.

A random sample of 8 residents of Persham is chosen.

- (a)** Find the probability that more than 2 and fewer than 8 of them rate their internet service as poor or satisfactory. [3]

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A random sample of 125 residents of Persham is now chosen.

- (b)** Use an approximation to find the probability that more than 72 of these residents rate their internet service as good. [5]

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- 2 Last year, an online store sold a large number of computers. 55% of the computers were made by company F , 30% were made by company G and 15% were made by company H .

A random sample of 3 customers who each bought a computer from this store is chosen.

- (a) Find the probability that the 3 customers bought computers all made by different companies. [1]

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A random sample of 12 customers who each bought a computer from this store is chosen.

- (b) Find the probability that fewer than 10 of these customers bought a computer made by company F . [3]

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(c) Use a suitable approximation to find the probability that more than 24 of these customers bought a computer made by company H . [5]

[illegible]

- (a) Find the probability that a randomly chosen green apple weighs between 83 grams and 95 grams. [4]

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- Use a suitable approximation to find the probability that fewer than 105 of the chosen red apples weigh more than 80 grams. [5]

[illegible]

- 4 A company sells small and large bags of rice. The masses of the small bags of rice are normally distributed with mean 1.20 kg and standard deviation 0.16 kg.
- (a) In a random sample of 500 of these small bags of rice, how many would you expect to have a mass greater than 1.26 kg? [4]

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The masses of the large bags of rice are normally distributed with mean 2.50 kg and standard deviation σ kg. 20% of these large bags of rice have a mass less than 2.40 kg.

- (b) Find the value of σ . [3]

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A random sample of 80 large bags of rice is chosen.

- (c) Use a suitable approximation to find the probability that fewer than 22 of these large bags of rice have a mass less than 2.40 kg. [5]

- 4** The 13 00 train from Jahor to Keman runs every day. The probability that the train arrives late in Keman is 0.35.

- (a) For a random sample of 7 days, find the probability that the train arrives late on fewer than 3 days. [3]

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A random sample of 142 days is taken.

- (b) Use an approximation to find the probability that the train arrives late on more than 40 days. [5]

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- (a) Find the probability that more than 9 of these students play at least one musical instrument. [3]

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- 5 In a certain area in the Arctic the probability that it snows on any given day is 0.7, independent of all other days.

- (a) Find the probability that in a week (7 days) it snows on at least five days. [3]

[illegible]

A week in which it snows on at least five days out of seven is called a 'white' week.

- (b) Find the probability that in three randomly chosen weeks at least one is a white week. [2]

Blank handwriting practice lines.

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- 6 At a company's call centre, 90% of callers are connected immediately to a representative.

A random sample of 12 callers is chosen.

- (a) Find the probability that fewer than 10 of these callers are connected immediately. [3]

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A random sample of 80 callers is chosen.

- (b) Use an approximation to find the probability that more than 69 of these callers are connected immediately. [5]

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- (c) Justify the use of your approximation in part (b). [1]

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6 In Questa, 60% of the adults travel to work by car.

(a) A random sample of 12 adults from Questa is taken.

Find the probability that the number who travel to work by car is less than 10. [3]

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(b) A random sample of 150 adults from Questa is taken.

Use an approximation to find the probability that the number who travel to work by car is less than 81. [5]

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(c) Justify the use of your approximation in part (b).

[1]

- (a) Find the probability that on each of 3 randomly chosen days, Richard's flight does not arrive late. [1]

[illegible]

- (b) Find the probability that for 9 randomly chosen days, Richard's flight arrives early at least 3 times. [3]

[illegible]

[5]

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- 6 Eli has four fair 4-sided dice with sides labelled 1, 2, 3, 4. He throws all four dice at the same time. The random variable X denotes the number of 2s obtained.

(a) Show that $P(X = 3) = \frac{3}{64}$. [2]

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(b) Complete the following probability distribution table for X . [2]

x	0	1	2	3	4
$P(X = x)$	$\frac{81}{256}$			$\frac{3}{64}$	$\frac{1}{256}$

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- (c) Find $E(X)$.

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Eli throws the four dice at the same time on 96 occasions.

- (d) Use an approximation to find the probability that he obtains at least two 2s on fewer than 20 of these occasions. [5]

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- 7 In the region of Arka, the total number of households in the three villages Reeta, Shan and Teber is 800. Each of the households was asked about the quality of their broadband service. Their responses are summarised in the following table.

		Quality of broadband service		
		Excellent	Good	Poor
Village	Reeta	75	118	32
	Shan	223	177	40
	Teber	12	60	63

- (a) (i) Find the probability that a randomly chosen household is in Shan and has poor broadband service. [1]

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- (ii) Find the probability that a randomly chosen household has good broadband service given that the household is in Shan. [2]

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In the whole of Arka there are a large number of households. A survey showed that 35% of households in Arka have no broadband service.

- (b) (i) 10 households in Arka are chosen at random.

Find the probability that fewer than 3 of these households have no broadband service. [3]

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- (ii) 120 households in Arka are chosen at random.

Use an approximation to find the probability that more than 32 of these households have no broadband service. [5]

- A student is chosen at random.

[1]

[illegible]

[2]

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On average at all the schools in this country 30% of the students do not like any sports.

- (b) (i) 10 of the students from this country are chosen at random.

Find the probability that at least 3 of these students do not like any sports. [3]

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- (ii) 90 students from this country are now chosen at random.

Use an approximation to find the probability that fewer than 32 of them do not like any sports. [5]

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