

Mixed practice 17

- 1 A factory making bottles knows that, on average, 1.5% of its bottles are defective. Find the probability that, in a randomly selected sample of 20 bottles, at least 1 bottle is defective.
- 2 The mark on a Physics test is an integer between 1 and 5 inclusive. The distribution of test grades is given in this table:

Mark	1	2	3	4	5
Probability	0.05	0.23	0.35	k	0.21

- a Find the value of k .
- b Find the probability that a randomly selected student scores at least a 3 in the test.
- c Write down the most likely mark in this test.
- 3 A spinner has four equal sections with numbers 1, 2, 5 and 7 written on them. The spinner is spun twice. Find the probability distribution of the positive difference between the scores (larger minus smaller).
- 4 When a boy bats at baseball, the probability that he hits the ball is 0.4. In practice he gets pitched 12 balls. Let X denote the total number of balls he hits. Assuming that his attempts are independent, find:
- a $P(X=3)$ b $P(X>5)$
- 5 A probability distribution of a variable X is shown in this table:

x	2	3	4	5	6
$P(X=x)$	p	0.2	0.3	0.3	q

- a Write down the value of $p+q$.
- b Given that $P(X \geq 4) = 0.75$, find the values of p and q .
- 6 Given that $X \sim B(8, 0.65)$, find:
- a $P(X < 6)$ b $P(X=8)$ c $P(5 \leq X < 7)$
- 7 When Robyn shoots an arrow at a target, the probability that she hits the target is 0.6. In a competition she has eight attempts to hit the target. If she gets at least 7 hits on target she will qualify for the next round.
- a Find the probability that she hits the target exactly 4 times.
- b Find the probability that she fails to qualify for the next round.
- c What assumption did you need to make in your answers in parts **a** and **b**?

- 8 A test is marked on the scale from 1 to 5. The cumulative distribution of test scores is shown in the table:

Grade (s)	1	2	3	4	5
P (grades $\leq s$)	0.32	0.48	0.65	0.82	1

Find the percentage of candidates whose grade was:

- a 2 b between 3 and 5 inclusive.

- 9 A student has the probability 0.7 of answering a question correctly, independently of any other questions.

Find the probability that, in a test containing 15 questions, the student gets more than seven but fewer than 12 correct answers.

- 10 A biased coin has probability p of showing heads. The coin is tossed 6 times. The probability that it shows no heads is 0.072. Find the value of p correct to two significant figures.

- 11 Sasha and Elijah both roll a fair six-sided dice.

- a Find the probability distribution of the difference between the scores (Sasha's score - Elijah's score).
b Hence find the probability that Elijah gets a higher score than Sasha.



- 12 i A biased coin is thrown twice. The probability that it shows heads both times is 0.04. Find the probability that it shows tails both times.
ii Another coin is biased so that the probability that it shows heads on any throw is p . The probability that the coin shows heads exactly once in two throws is 0.42. Find the possible values of p .

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- 13 A company producing light bulbs knows that the probability that a new light bulb is defective is 0.5%.

- a Find the probability that a pack of six light bulbs contains at least one defective one.
b Hamish buys 20 packs of six light bulbs. Find the probability that more than 4 of the boxes contain at least one defective light bulb.

- 14 A fair coin is tossed repeatedly until it shows tails.

- a Find the probability that the first five tosses all show heads.
b Hence find the probability that the first tails appear on the sixth toss.

- 15** The probability that a student forgets to do homework is 5% independently of other students. If at least one student forgets to do homework, the whole class has to do a test.
- There are 12 students in a class. Find the probability that the class will have to do a test.
 - For a class with n students, write down an expression for the probability that the class will have to do a test.
 - Hence find the smallest number of students in the class such that the probability that the class will have to do a test is at least 80%.

- 16** Two fair dice are rolled and the difference between the two scores is recorded (larger – smaller).
- Find the probability distribution of the recorded number.
 - This experiment is repeated ten times. Find the probability that the recorded number is zero on more than three occasions.

- 17** Four fair six-sided dice are rolled. Let X be the largest number rolled.

- Explain why $P(X \leq k) = \left(\frac{k}{6}\right)^4$, for $k=1, 2, \dots, 6$.
- Copy and complete the following probability distribution table.

x	1	2	3	4	5	6
$P(X=x)$		$\frac{15}{1296}$	$\frac{65}{1296}$			$\frac{671}{1296}$

- 18** A fair six-sided dice is rolled until the fourth 6 is obtained.
- Find the probability that there are exactly three 6s in the first seven rolls.
 - Hence find the probability that the fourth 6 is obtained on the eighth roll.

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1 0.261

2 a $k=0.16$ b 0.72 c 3

3

x	0	1	2	3	4	5	6
$P(X=x)$	$\frac{1}{4}$	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$

4 a 0.142 b 0.335

5 a 0.2 b $p=0.05, q=0.15$

6 a 0.572 b 0.0319 c 0.537

7 a 0.232 b 0.894

c That the attempts are independent of each other

8 a 16% b 52%

9 0.653

10 0.36

11 a

x	-5	-4	-3	-2	-1	0	1	2	3	4	5
$P(X=x)$	$\frac{1}{36}$	$\frac{2}{36}$	$\frac{3}{36}$	$\frac{4}{36}$	$\frac{5}{36}$	$\frac{6}{36}$	$\frac{5}{36}$	$\frac{4}{36}$	$\frac{3}{36}$	$\frac{2}{36}$	$\frac{1}{36}$

b $\frac{5}{12}$

12 a 0.64

b $p=0.3$ or 0.7

13 a 0.0296 b 2.44×10^{-4}

14 a 0.031 25 b 0.015 625

15 a 0.460 b $1 - (0.95)^n$

c 32

16 a

x	0	1	2	3	4	5
$P(X=x)$	$\frac{6}{36}$	$\frac{10}{36}$	$\frac{8}{36}$	$\frac{6}{36}$	$\frac{4}{36}$	$\frac{2}{36}$

b 0.0697

17 a Proof

b

1	4	5
$\frac{1}{1296}$	$\frac{175}{1296}$	$\frac{369}{1296}$

18 a 0.0781

b 0.0130