

# Normal Distribution and Binomial Distribution Quiz

66 min  
66 marks

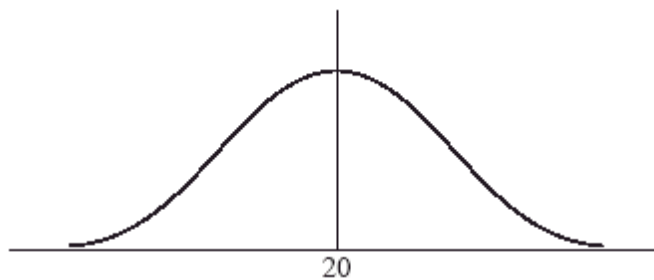
1. A random variable  $X$  is distributed normally with a mean of 20 and variance 9.

(a) Find  $P(X \leq 24.5)$ .

(3)

(b) Let  $P(X \leq k) = 0.85$ .

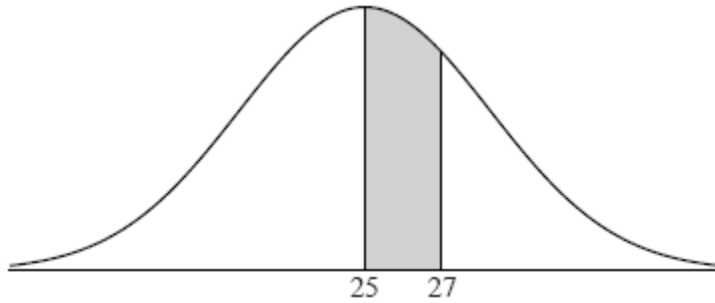
(i) Represent this information on the following diagram.



(ii) Find the value of  $k$ .

(5)  
(Total 8 marks)

2. Let the random variable  $X$  be normally distributed with mean 25, as shown in the following diagram.



The shaded region between 25 and 27 represents 30 % of the distribution.

- (a) Find  $P(X > 27)$ . (2)

- (b) Find the standard deviation of  $X$ . (5)
- (Total 7 marks)**

3. The weights of players in a sports league are normally distributed with a mean of 76.6 kg, (correct to three significant figures). It is known that 80 % of the players have weights between 68 kg and 82 kg. The probability that a player weighs less than 68 kg is 0.05.

- (a) Find the probability that a player weighs more than 82 kg. (2)

- (b) (i) Write down the standardized value,  $z$ , for 68 kg.
- (ii) Hence, find the standard deviation of weights. (4)

To take part in a tournament, a player's weight must be within 1.5 standard deviations of the mean.

- (c) (i) Find the set of all possible weights of players that take part in the tournament.
- (ii) A player is selected at random. Find the probability that the player takes part in the tournament.

(5)

Of the players in the league, 25 % are women. Of the women, 70 % take part in the tournament.

- (d) Given that a player selected at random takes part in the tournament, find the probability that the selected player is a woman.

(4)

(Total 15 marks)

4. A box holds 240 eggs. The probability that an egg is brown is 0.05.

- (a) Find the expected number of brown eggs in the box.

(2)

- (b) Find the probability that there are 15 brown eggs in the box.

(2)

- (c) Find the probability that there are at least 10 brown eggs in the box.

(3)

(Total 7 marks)

5. Evan likes to play two games of chance, A and B.

For game A, the probability that Evan wins is 0.9. He plays game A seven times.

- (a) Find the probability that he wins exactly four games.

(2)

For game B, the probability that Evan wins is  $p$ . He plays game B seven times.

(b) Write down an expression, in terms of  $p$ , for the probability that he wins exactly four games. (2)

(c) Hence, find the values of  $p$  such that the probability that he wins exactly four games is 0.15. (3)  
(Total 7 marks)

6. Jan plays a game where she tosses two fair six-sided dice. She wins a prize if the sum of her scores is 5.

(a) Jan tosses the two dice once. Find the probability that she wins a prize. (3)

(b) Jan tosses the two dice 8 times. Find the probability that she wins 3 prizes. (2)  
(Total 5 marks)

7. A test has five questions. To pass the test, at least three of the questions must be answered correctly.

The probability that Mark answers a question correctly is  $\frac{1}{5}$ . Let  $X$  be the number of questions that Mark answers correctly.

(a) (i) Find  $E(X)$ .  
(ii) Find the probability that Mark passes the test. (6)

Bill also takes the test. Let  $Y$  be the number of questions that Bill answers correctly. The following table is the probability distribution for  $Y$ .

$y$	0	1	2	3	4	5
$P(Y = y)$	0.67	0.05	$a + 2b$	$a - b$	$2a + b$	0.04

(b) (i) Show that  $4a + 2b = 0.24$ .

(ii) Given that  $E(Y) = 1$ , find  $a$  and  $b$ .

**(8)**

(c) Find which student is more likely to pass the test.

**(3)**

**(Total 17 marks)**