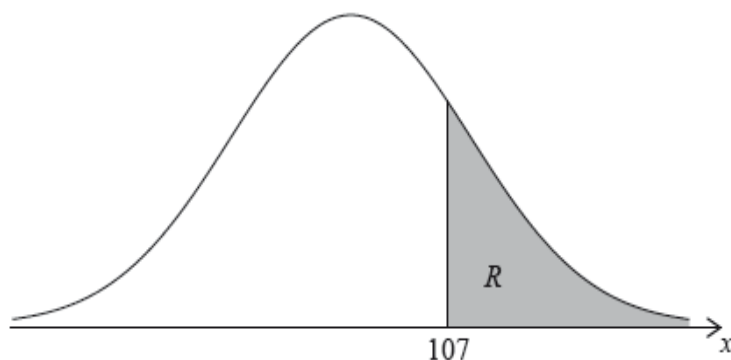


Problem Set: Normal distributions

1a. The random variable X is normally distributed with a mean of 100. The following diagram shows the normal curve for X .



Let R be the shaded region under the curve, to the right of 107. The area of R is 0.24.

Write down $P(X > 107)$.

[1 mark]

1b. Find $P(100 < X < 107)$.

[3 marks]

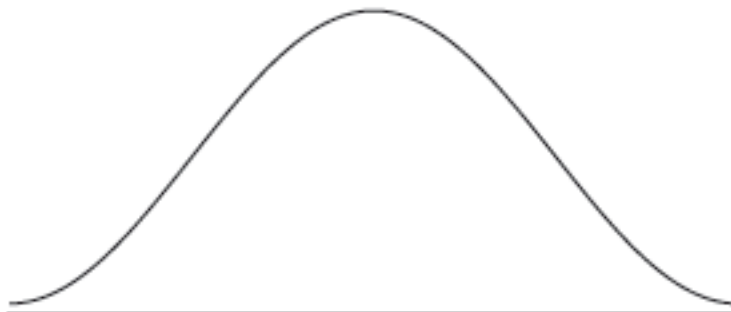
1c. Find $P(93 < X < 107)$.

[2 marks]

2a. A random variable X is distributed normally with a mean of 20 and standard deviation of 4.

On the following diagram, shade the region representing $P(X \leq 25)$.

[2 marks]



2b. Write down $P(X \leq 25)$, correct to two decimal places.

[2 marks]

2c. Let $P(X \leq c) = 0.7$. Write down the value of c .

[2 marks]

3a. The time taken for a student to complete a task is normally distributed with a mean of **20** minutes and a standard deviation of **1.25** minutes.

A student is selected at random. Find the probability that the student completes the task in less than **21.8** minutes. *[2 marks]*

3b. The probability that a student takes between **k** and **21.8** minutes is **0.3**. Find the value of **k** . *[5 marks]*

4a. The weights, **W** , of newborn babies in Australia are normally distributed with a mean **3.41** kg and standard deviation **0.57** kg. A newborn baby has a low birth weight if it weighs less than **w** kg.

Given that **5.3%** of newborn babies have a low birth weight, find **w** . *[3 marks]*

4b. A newborn baby has a low birth weight.

Find the probability that the baby weighs at least **2.15** kg. *[3 marks]*

5a. The masses of watermelons grown on a farm are normally distributed with a mean of **10** kg.

The watermelons are classified as small, medium or large.

A watermelon is small if its mass is less than **4** kg. Five percent of the watermelons are classified as small.

Find the standard deviation of the masses of the watermelons. *[4 marks]*

5b. The following table shows the percentages of small, medium and large watermelons grown on the farm.

small	medium	large
5 %	57 %	38 %

A watermelon is large if its mass is greater than **w** kg.

Find the value of **w** . *[2 marks]*

5c. All the medium and large watermelons are delivered to a grocer. *[3 marks]*

The grocer selects a watermelon at random from **this** delivery. Find the probability that it is medium.

6a. The maximum temperature T , in degrees Celsius, in a park on six randomly selected days is shown in the following table. The table also shows the number of visitors, N , to the park on each of those six days.

Maximum temperature (T)	4	5	17	31	29	11
Number of visitors (N)	24	26	36	38	46	28

The relationship between the variables can be modelled by the regression equation $N = aT + b$.

Find the value of a and of b . [3 marks]

6b. Write down the value of r . [1 mark]

6c. Use the regression equation to estimate the number of visitors on a day when the maximum temperature is 15 °C. [3 marks]

7a. The price of a used car depends partly on the distance it has travelled. The following table shows the distance and the price for seven cars on 1 January 2010.

Distance, x km	11 500	7500	13 600	10 800	9500	12 200	10 400
Price, y dollars	15 000	21 500	12 000	16 000	19 000	14 500	17 000

The relationship between x and y can be modelled by the regression equation $y = ax + b$.

(i) Find the correlation coefficient.

(ii) Write down the value of a and of b . [4 marks]

7b. On 1 January 2010, Lina buys a car which has travelled 11 000 km.

Use the regression equation to estimate the price of Lina's car, giving your answer to the nearest 100 dollars. [3 marks]

7c. The price of a car decreases by 5% each year.

Calculate the price of Lina's car after 6 years. [4 marks]

7d. Lina will sell her car when its price reaches 10 000 dollars.

Find the year when Lina sells her car. [4 marks]