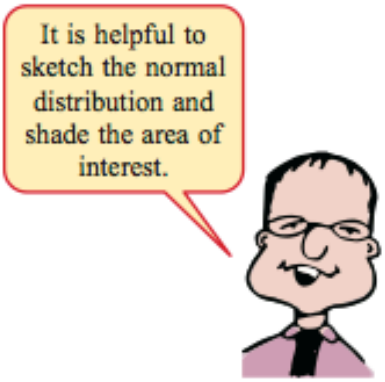
EXERCISE 10B

1 X is a random variable that is distributed normally with mean 70 and standard deviation 4. Find:

a $P(70 \leqslant X \leqslant 74)$ **b** $P(68 \leqslant X \leqslant 72)$ **c** $P(X \leqslant 65)$



2 X is a random variable that is distributed normally with mean 60 and standard deviation 5. Find:

a $P(60 \leqslant X \leqslant 65)$ **b** $P(62 \leqslant X \leqslant 67)$

c $P(X \geqslant 64)$ **d** $P(X \leqslant 68)$

e $P(X \leqslant 61)$ **f** $P(57.5 \leqslant X \leqslant 62.5)$

3 X is a random variable that is distributed normally with mean 32 and standard deviation 6. Find:

a $P(25 \leqslant X \leqslant 30)$ **b** $P(X > 27)$ **c** $P(22 \leqslant X \leqslant 28)$

d $P(X \leqslant 30.9)$ **e** $P(X < 23.8)$ **f** $P(22.1 < X < 32.1)$

4 Suppose $X \sim N(37, 7^2)$.

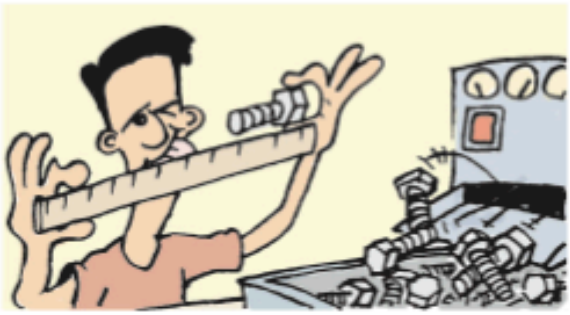
a Use technology to find $P(X > 40)$.

b Hence find $P(37 \leqslant X \leqslant 40)$ without technology.

5 A manufacturer makes nails which are supposed to be 50 mm long. In reality, the length L of the nails is normally distributed with mean 50.2 mm and standard deviation 0.93 mm. Find:

a $P(L \geqslant 50)$ **b** $P(L \leqslant 51)$ **c** $P(49 \leqslant L \leqslant 50.5)$

6 A machine produces metal bolts. The lengths of these bolts have a normal distribution with mean 19.8 cm and standard deviation 0.3 cm. If a bolt is selected at random from the machine, find the probability that it will have a length between 19.7 cm and 20 cm.



7 Max's customers put money for charity into a collection box in his shop. The average weekly collection is approximately normally distributed with mean \$40 and standard deviation \$6.

a In a randomly chosen week, find the probability of Max collecting:

i between \$30.00 and \$50.00 **ii** at most \$32.00.

b In a 52 week year, in how many weeks would Max expect to collect at least \$45.00?

9 The speed of cars passing the supermarket is normally distributed with mean 56.3 $km\,h^{-1}$ and standard deviation 7.4 $km\,h^{-1}$. Find the probability that a randomly selected car has speed:

a between 60 and 75 $km\,h^{-1}$ **b** at most 70 $km\,h^{-1}$ **c** at least 60 $km\,h^{-1}$.

EXERCISE 10C

1 Suppose $X \sim N(20, 3^2)$. Illustrate with a sketch and find k such that:

a $P(X \leqslant k) = 0.348$ **b** $P(X \leqslant k) = 0.878$ **c** $P(X \leqslant k) = 0.5$

2 Suppose $X \sim N(38.7, 8.2^2)$. Illustrate with a sketch and find k such that:

a $P(X \leqslant k) = 0.9$ **b** $P(X \geqslant k) = 0.8$

5 The students of Class X sat a Physics test. The average score was 46 with a standard deviation of 25. The teacher decided to award an A to the top 7% of the students in the class. Assuming that the scores were normally distributed, find the lowest score that would achieve an A.

6 The lengths of a fish species are normally distributed with mean 35 cm and standard deviation 8 cm. The fisheries department has decided that the smallest 10% of the fish are not to be harvested. What is the size of the smallest fish that can be harvested?

7 The lengths of screws produced by a machine are normally distributed with mean 75 mm and standard deviation 0.1 mm. If a screw is too long it is automatically rejected. If 1% of screws are rejected, what is the length of the smallest screw to be rejected?

8 The weights of cabbages sold at a market are normally distributed with mean 1.6 kg and standard deviation 0.3 kg.

a One wholesaler buys the heaviest 10% of cabbages. What is the minimum weight cabbage he buys?

b Another buyer choose cabbages with weights in the lower quartile. What is the heaviest cabbage this person buys?

9 The volumes of cool drink in bottles filled by a machine are normally distributed with mean 503 mL and standard deviation 0.5 mL. 1% of the bottles are rejected because they are underfilled, and 2% are rejected because they are overfilled; otherwise they are kept for retail. What range of volumes is in the bottles that are kept?

EXERCISE 10B

1 **a** 0.341 **b** 0.383 **c** 0.106

2 **a** 0.341 **b** 0.264 **c** 0.212 **d** 0.945
e 0.579 **f** 0.383

3 **a** 0.248 **b** 0.798 **c** 0.205 **d** 0.427
e 0.0859 **f** 0.457

4 **a** 0.334 **b** 0.166

5 **a** 0.585 **b** 0.805 **c** 0.528 **6** 0.378

7 **a** I 0.904 II 0.0912 **b** $\approx$ 11 weeks

8 **a** 0.0509 **b** 52.1% **c** $\approx$ 47 eels

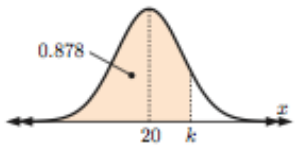
9 **a** 0.303 **b** 0.968 **c** 0.309

EXERCISE 10C

1 **a**

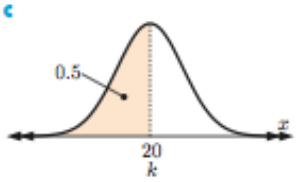
$k \approx 18.8$

b



$k \approx 23.5$

c

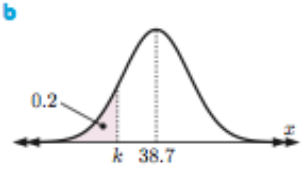


$k = 20$

2 **a**

$k \approx 49.2$

b



$k \approx 31.8$

5 83 **6** 24.7 cm **7** 75.2 mm

8 **a** 1.98 kg **b** 1.40 kg **9** 502 mL to 504 mL