Jawapan

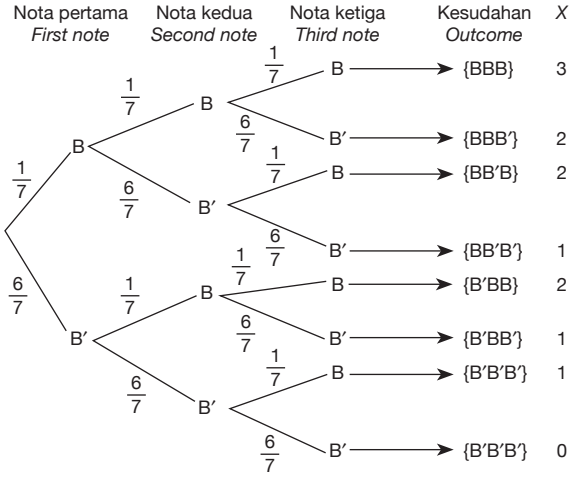
Praktis 5

Praktis Formatif

1 (a) Bilangan ovum yang berjaya disenyawakan oleh sperma.
The number of ova that are successfully fertilised by the sperms.
(b) Suhu badan pesakit.
Patient's body temperature.
(c) Kehadiran pelajar setiap hari.
The daily attendance of students.

2 (a) Pemboleh ubah rawak selanjar
Continuous random variable
$X = \{40 \text{ min/}mins \leqslant x \leqslant 60 \text{ min/}mins\}$
(b) Pemboleh ubah rawak diskret, $X = \{3, 4, 5\}$
Discrete random variable, $X = \{3, 4, 5\}$

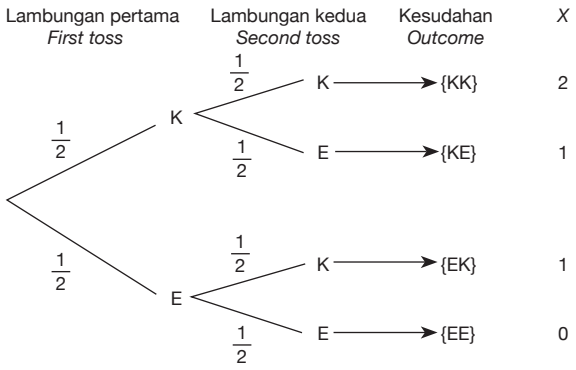
3 (i) (a) $X = \{0, 1, 2, 3\}$
(b)



B – Betul/*Correct*
B′ – Salah/*Wrong*
(c)

x	0	1	2	3
$P(X = x)$	$\frac{216}{343}$	$\frac{108}{343}$	$\frac{18}{343}$	$\frac{1}{343}$

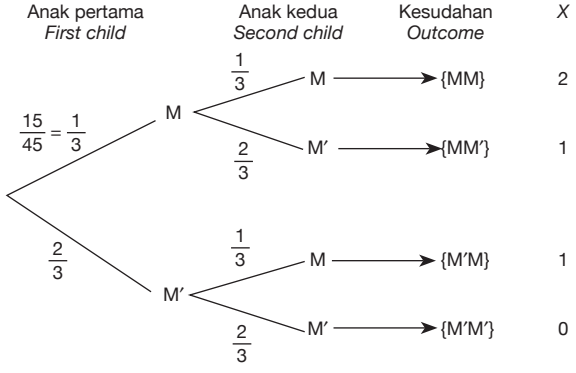
(ii) (a) $X = \{0, 1, 2\}$
(b)



K – Kepala/*Head*
E – Ekor/*Tail*
(c)

x	0	1	2
$P(X = x)$	$\frac{1}{4}$	$\frac{1}{2}$	$\frac{1}{4}$

(iii) (a) $X = \{0, 1, 2\}$
(b)

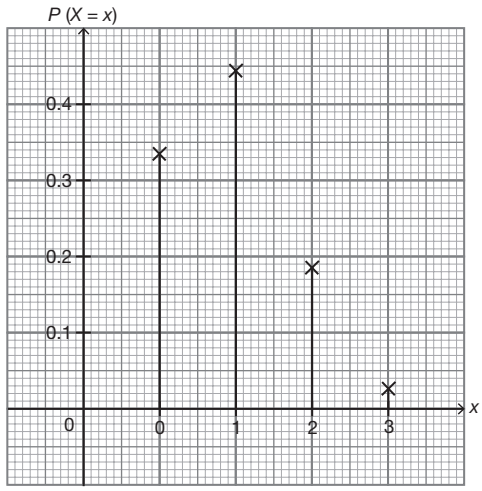


M – Epal merah/*Red apple*
E – Epal warna lain/*Apple of another colour*
(c)

x	0	1	2
$P(X = x)$	$\frac{1}{9}$	$\frac{4}{9}$	$\frac{4}{9}$

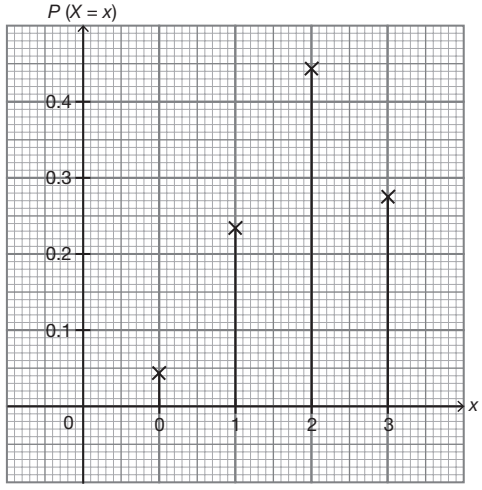
4 (a)

x	0	1	2	3
$P(X = x)$	0.343	0.441	0.189	0.027



(b)

x	0	1	2	3
$P(X = x)$	0.043	0.239	0.443	0.275



5 $X = \{0, 1, 2\}$
Pemboleh ubah rawak diskret kerana mempunyai nilai tersendiri yang boleh dibilang.
Discrete random variable because its value can be counted.

6 (a) Pemboleh ubah rawak diskret
Discrete random variable
(b) $X = \{0, 1, 2, 3\}$
(c) $2m = 1 - (0.462 + 0.322)$
$m = 0.108$

7 (a) Taburan binomial kerana kebarangkalian memperoleh bola dengan warna tertentu adalah tetap dan bilangan kali berjaya memperoleh bola dengan warna tertentu merupakan nilai tersendiri yang boleh dibilang.
Binomial distribution because the probability to get balls of certain colour is fix and the number of times of drawing balls of certain colour successfully is a discrete value that can be counted.
(b) Bukan taburan binomial kerana kebarangkalian memperoleh bola dengan warna tertentu berbeza kerana bergantung kepada kesudahan sebelumnya.
Not a binomial distribution as the probability to obtain balls of certain colour is different because it is dependent to the previous outcomes.
(c) Bukan taburan binomial kerana mempunyai lebih daripada dua kesudahan.
Not a binomial distribution because it has more than 2 outcomes.

8 $n = 10$
p = kebarangkalian pelajar menghadiri semua pengajaran dalam talian
$=$ *the probability of students attend all the online lessons*
$= 0.85$
$q = 0.15$
(a) $P(X = 10) = {}^{10}C_{10}(0.85)^{10}\,(0.15)^{0}$
$= 0.1969$
(b) $P(X \geqslant 8)$
$= P(X = 8) + P(X = 9) + P(X = 10)$
$= {}^{10}C_{8}(0.85)^{8}\,(0.15)^{2} + {}^{10}C_{9}(0.85)^{9}\,(0.15)^{1} + {}^{10}C_{10}(0.85)^{10}\,(0.15)^{0}$
$= 0.2759 + 0.3474 + 0.1969$
$= 0.8202$

9 $n = 8$
p = kebarangkalian penduduk tidak mempunyai kereta
the probability of residents who do not own any car
$= 0.05$
$q = 0.95$
(a) $P(X = 2) = {}^{8}C_{2}(0.05)^{2}\,(0.95)^{6}$
$= 0.0515$
(b) lebih daripada 2 penduduk mempunyai kereta
= selebih-lebihnya 2 penduduk tidak berkereta
more than 2 residents own at least a car = at most 2 residents do not own any car
$P(X \leqslant 2) = P(X = 0) + P(X = 1) + P(X = 2)$
$= {}^{8}C_{0}(0.05)^{0}\,(0.95)^{8} + {}^{8}C_{1}(0.05)^{1}\,(0.95)^{7} + {}^{8}C_{2}(0.05)^{2}\,(0.95)^{6}$
$= 0.6634 + 0.2793 + 0.0515$
$= 0.9942$

10 $p = 0.6$, $q = 0.4$
(a) $n = 5$
$P(X \geqslant 2) = 1 - P(X = 0) - P(X = 1)$
$= 1 - {}^{5}C_{0}(0.6)^{0}\,(0.4)^{5} - {}^{5}C_{1}(0.6)^{1}\,(0.4)^{4}$
$= 1 - 0.01024 - 0.0768$
$= 0.91296$
(b) $n = m$
$P(X = 1) = 6P(X = 0)$
${}^{m}C_{1}(0.6)^{1}\,(0.4)^{m-1} = 6 \times {}^{m}C_{0}(0.6)^{0}\,(0.4)^{m}$
$0.6m\left(\dfrac{0.4^{m}}{0.4}\right) = 6(0.4)^{m}$
$0.6m = 6(0.4)$
$m = 4$

11 $n = 10$
(a) $P(X = 0) = 0.9044$
${}^{10}C_{0}\,(p)^{0}\,(1-p)^{10} = 0.9044$
$\lg\,(1-p)^{10} = \lg 0.9044$

$10 \lg (1-p) = -0.04364$

$\lg (1-p) = -0.004364$

$1-p = 10^{-0.004364}$

$p = 1 - 0.99$

$= 0.01$

(b) $P(X=2) = {}^{10}C_2(0.02)^2(0.99)^8$

$= 0.0042$

12 (a) $n = 500, p = \frac{4}{5}$

Nilai jangkaan/*Expected value* $= np$

$= 400$

Varians/*Variance*, $\sigma^2 = npq$

$= 400\left(\frac{1}{5}\right)$

$= 80$

Sisihan piawai/*Standard deviation*, $\sigma = \sqrt{80}$

$= 8.94$

(b) $n = 20, p = \frac{1}{4}$

Min/*Mean* $= np$

$= 5$

Sisihan piawai/*Standard deviation*, $\sigma = \sqrt{npq}$

$= \sqrt{5\left(\frac{3}{4}\right)}$

$= 1.94$

13 (a) Kebarangkalian damak terkena papan damak pada tempat lebih dekat dengan *bullseye* daripada lilitan papan

Probability a dart hit the dart board at a place nearer to the bullseye than the circumference of the board

$= \frac{\pi\left(\frac{1}{2}r\right)^2}{\pi r^2}$

$= \frac{1}{4}$

$= 0.25$

Biar B peristiwa balingan damak yang lebih dekat dengan *bullseye* daripada lilitan papan

Let B the event of getting dart thrown that is nearer to the bullseye than the circumference of the board

(i) $P(B'B'B) = (0.75)(0.75)(0.25)$

$= 0.1406$

(ii) $P(B) + P(B'B) + P(B'B'B)$

$= (0.25) + (0.75)(0.25) + (0.75)(0.75)(0.25)$

$= 0.5781$

$n = ?, p = 0.25, P(X \geqslant 1) \geqslant 0.85$

$1 - P(X=0) \geqslant 0.85$

$1 - 0.85 \geqslant P(X=0)$

$0.15 \geqslant {}^nC_0(0.25)^0(0.75)^n$

$(0.75)^n \leqslant 0.15$

$n \lg 0.75 \leqslant \lg 0.15$

$n \geqslant \frac{\lg 0.15}{\lg 0.75}$

$n \geqslant 6.59$

$n_{\min} = 7$

(b) p = kebarangkalian mendapat telur rosak

probability of rotten egg obtained

$= \frac{2}{30}$

$= \frac{1}{15}$

$P(X \geqslant 1) > 0.9$

$1 - P(X=0) > 0.9$

$1 - 0.9 > {}^nC_0\left(\frac{1}{15}\right)^0\left(\frac{14}{15}\right)^n$

$0.1 > \left(\frac{14}{15}\right)^n$

$\log 0.1 > \log\left(\frac{14}{15}\right)^n$

$\log 0.1 > n \log\left(\frac{14}{15}\right)$

$\frac{\log 0.1}{\log\left(\frac{14}{15}\right)} < n$

$n > 33.37$

$n_{\min} = 34$

(i) $n = 15, P(X=0) = {}^{15}C_0\left(\frac{1}{15}\right)^0\left(\frac{14}{15}\right)^{15}$

$= 0.3553$

(ii) $P(X=1) = {}^{15}C_1\left(\frac{1}{15}\right)^1\left(\frac{14}{15}\right)^{14}$

$= 0.3806$

14 (a) $n = 4$

(b) $P(X \leqslant 2) = 0.316 + 0.422 + 0.211$

$= 0.949$

$= 94.9\%$

(c) $P(X=0) = 0.316$

${}^4C_0(p)^0(1-p)^4 = 0.316$

$4 \log (1-p) = \log 0.316$ atau/*or* $1 - p = 0.316^{\frac{1}{4}}$

$\log (1-p) = -0.125$ $1 - 0.316^{\frac{1}{4}} = p$

$1 - p = 10^{-0.125}$ $p = 0.25$

$p = 1 - 0.7499$

$p = 0.25$

(d) Bilangan penduduk/*number of residents*

$= 1.55 \text{ mil} \times 0.25$

$= 387\,500$

15 $X \sim \text{B}\left(6, \frac{1}{4}\right)$

$P(X=5) = {}^6C_5\left(\frac{1}{4}\right)^5\left(\frac{3}{4}\right)^1$

$= \frac{9}{2\,048} // 0.004395$

(b) $P(X \geqslant 2) = 1 - [P(X=0) + P(X=1)]$

$= 1 - \left[{}^6C_0\left(\frac{1}{4}\right)^0\left(\frac{3}{4}\right)^6 {}^6C_1 + \left(\frac{1}{4}\right)^1\left(\frac{3}{4}\right)^5\right]$

$= \frac{1\,909}{4\,096} // 0.4661$

16 $p = \frac{1}{2}, P(X \geqslant 1) \geqslant 0.99$

$1 - P(X=0) \geqslant 0.99$

$P(X=0) \leqslant 1 - 0.99$

${}^nC_0\left(\frac{1}{2}\right)^0\left(\frac{1}{2}\right)^n \leqslant 0.01$

$n \log\left(\frac{1}{2}\right) \leqslant \log 0.01$

$n \geqslant 6.6439$

$n_{\min} = 7$

17 $X \sim \text{B}(50, 0.03)$

$P(X > 1) = 1 - [P(X = 0) + P(X = 1)]$

$= 1 - [{}^{50}C_0(0.03)^0(0.97)^{50} + {}^{50}C_1(0.03)^1(0.97)^{49}]$

$= 0.4447$

Min/*Mean* $= np$

$= 50\ (0.03)$

$= 1.5$

Sisihan piawai/*Standard deviation* $= \sqrt{npq}$

$= \sqrt{50(0.03)(0.97)}$

$= 1.206$

18 $X \sim \text{B}(10, 0.01)$

ditolak jika/*rejected if* $X > 1$,

diterima jika/*accepted if* $X \leqslant 1$

$\therefore\ P(X \leqslant 1) = P(X = 0) + P(X = 1)$

$= {}^{10}C_0(0.01)^0(0.99)^{10} + {}^{10}C_1(0.01)^1(0.99)^9$

$= 0.9958$

19 $X \sim \text{B}(15, p)$

(a) $P(X = 0) = 0.0874$

${}^{15}C_0(p)^0(1-p)^{15} = 0.0874$

$15\log(1-p) = \log 0.0874$ atau/*or* $1 - p = \sqrt[15]{0.0874}$

$\log(1-p) = -0.0706$ atau/*or* $p = 1 - 0.85$

$(1-p) = 10^{-0.0706}$ atau/*or* $= 0.15$

$p = 1 - 0.85$

$= 0.15$

(b) $P(X \geqslant 4)$

$= 1 - [P(X = 0) + P(X = 1) + P(X = 2) + P(X = 3)]$

$= 1 - [{}^{15}C_0(0.15)^0(0.85)^{15} + {}^{15}C_1(0.15)^1(0.85)^{14}$

$+ {}^{15}C_2(0.15)^2(0.85)^{13} + {}^{15}C_3(0.15)^3(0.85)^{12}]$

$= 0.1774$

(c) Bilangan jangkaan/*Expected number* $= np$

$= 401\,000(0.15)$

$= 60\,150$

20 (a) (i) Min/*Mean*, $\mu = 15$

(ii) $P(10 < X < 20)$

(iii) $P(X > 20) = \dfrac{1 - 0.68}{2}$

$= 0.16$

(b) $60 - 35 = 85 - 60 \qquad \therefore P(X > 85) = 0.16$

$P(35 < X < 85) = 1 - 2(0.16)$

$= 0.68$

68% daripada data terletak antara min $\pm\ 1\sigma$

68% *of the data lies between mean* $\pm\ 1\sigma$

$\therefore\ 85 = 60 + \sigma$

$\sigma = 25$

(c) (i) 25 min/*mins* $< x <$ 35 min/*mins*

(ii) 20 min/*mins* $< x <$ 40 min/*mins*

(iii) 15 min/*mins* $< x <$ 45 min/*mins*

(d) $2.4 = \mu_1 - 2\sigma$

$2\sigma = 3.2 - 2.4$

$= 0.8$

$\therefore P(X < 2.4) = P(X > \mu_2)$

$\therefore \mu_2 = 3.2 + 2\sigma$

$= 4.0$

21 (a) $Z = \dfrac{20 - 24}{\sqrt{3.7}}$

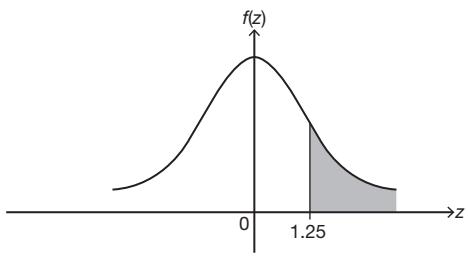
$= -2.0795$

(b) $1.319 = \dfrac{11.5 - 9.6}{\sigma}$

$\sigma = \dfrac{11.5 - 9.6}{1.319}$

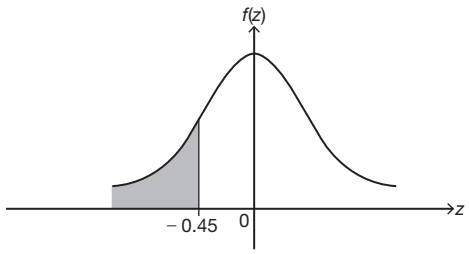
$= 1.44$

22 (a) $P(Z > 1.25) = 0.1057$



(b) $P(Z < -0.45) = P(Z > 0.45)$

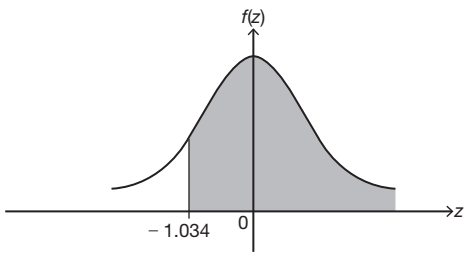
$= 0.3246$



(c) $P(Z > -1.034) = 1 - P(Z > 1.034)$

$= 1 - 0.1506$

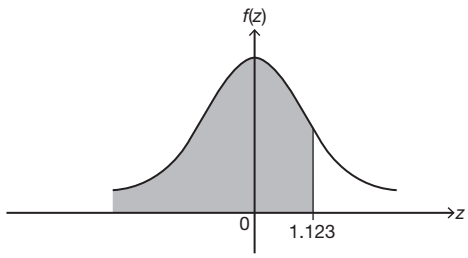
$= 0.8494$



(d) $P(Z < 1.123) = 1 - P(Z > 1.123)$

$= 1 - 0.1308$

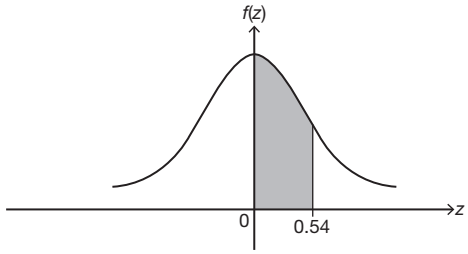
$= 0.8692$



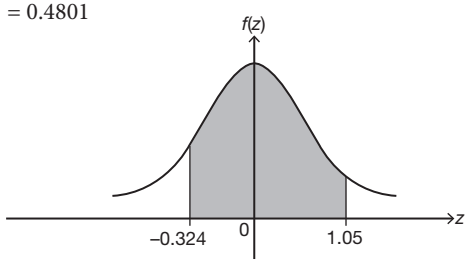
(e) $P(0 < Z < 0.54) = 0.5 - P(Z > 0.54)$

$= 0.5 - 0.2946$

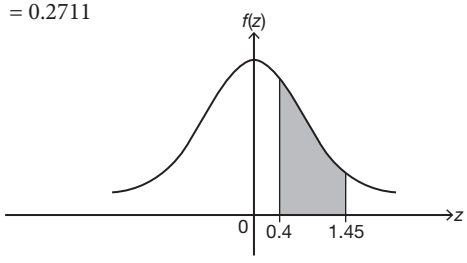
$= 0.2054$



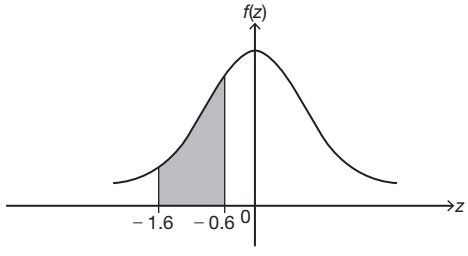
(f) $P(-0.324 < Z < 1.05)$
$= 1 - P(Z > 1.05) - P(Z > 0.324)$
$= 1 - 0.1469 - 0.373$
$= 0.4801$



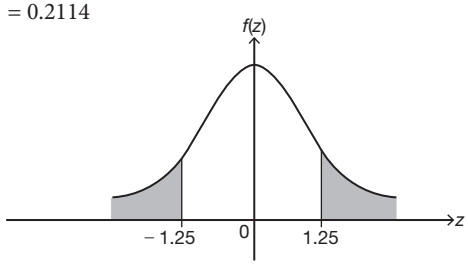
(g) $P(0.4 < Z < 1.45)$
$= P(Z > 0.4) - P(Z > 1.45)$
$= 0.3446 - 0.0735$
$= 0.2711$



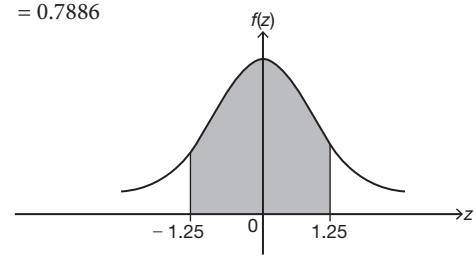
(h) $P(-1.6 < Z < -0.6)$
$= P(Z > 0.6) - P(Z > 1.6)$
$= 0.2743 - 0.0548$
$= 0.2195$



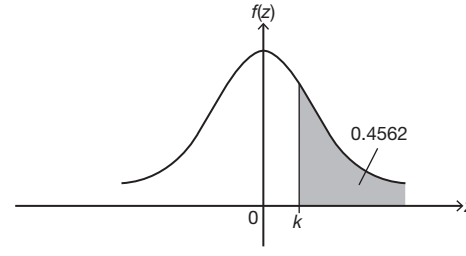
(i) $P(|Z| > 1.25)$
$= P(Z < -1.25) + P(Z > 1.25)$
$= 2\,(0.1057)$
$= 0.2114$



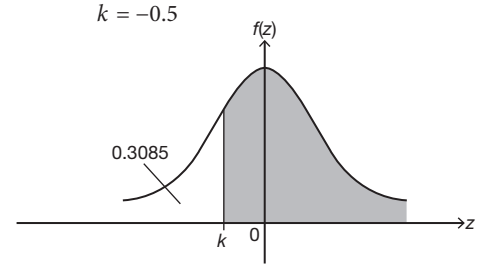
(j) $P|Z| < 1.25)$
$= P\,(-1.25 < Z < 1.25)$
$= 1 - 2(0.1057)$
$= 0.7886$



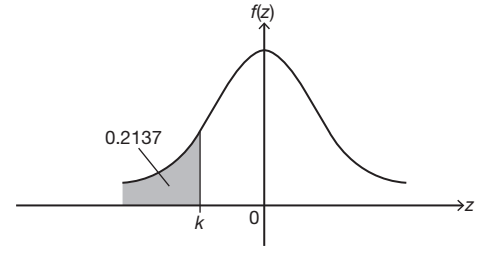
23 (a) $P(Z > k) = 0.4562$
$k = 0.11$



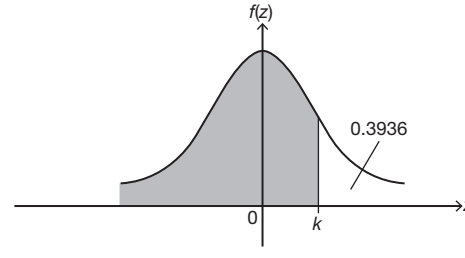
(b) $P(Z > k) = 0.6915$
$P(Z < k) = 1 - 0.6915$
$= 0.3085$
$k = -0.5$



(c) $P(Z < k) = 0.2137$
$k = -0.794$



(d) $P(Z < k) = 0.6064$
$P(Z > k) = 1 - 0.6064$
$= 0.3936$
$k = 0.27$



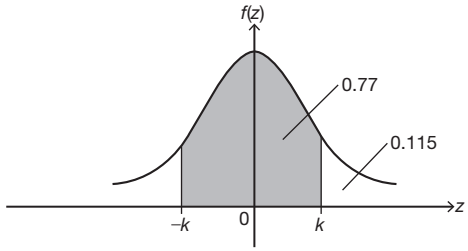
(e) $P(|Z| > k) = 0.77$

$P(-k < Z < k) = 0.77$

$P(Z > k) = \dfrac{1 - 0.77}{2}$

$= 0.115$

$k = 1.2$



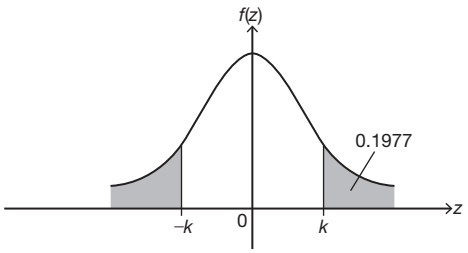
(f) $P(|Z| > k) = 0.3953$

$P(Z > k) = \dfrac{0.3952}{2}$

$= 0.19765$

≈ 0.1977

$k = 0.85$



24 (a) $\mu = 4.6$

(b) $P(X < a) = \dfrac{1 - 0.95}{2}$ (guna hukum/*use the rule of* 68-95-99.8)

$= 0.025$

$P(X > a) = 0.975$

atau/*or*

$P(Z > -2) = 1 - 0.0228$ (2 sisihan piawai daripada min/2 *standard deviation from mean*)

$= 0.9772$

(c) $b = 4.6 + 3\sigma$

$= 4.6 + 3\sqrt{0.25}$

$= 6.1$

25 Berdasarkan hukum 68-95-99.8,
Based on the 69-95-99.8 *rule,*

$\mu - 2\sigma = 8$

$\mu + 2\sigma = 12$

$2\mu = 8 + 12$

$\mu = 10$

$2\sigma = 12 - 10$

$\sigma = 1$

26 $P(Z < k) = 0.5 - 0.3453$

$= 0.1547$

27 $X \sim N(500, 85^2)$

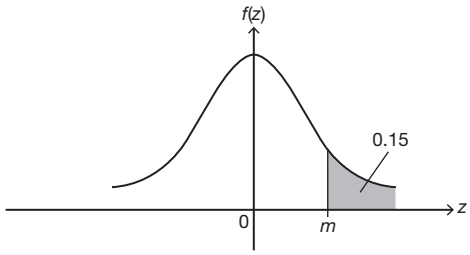
Li Lian mesti berada di kumpulan 15% teratas/*Li Lian must be in the top* 15%

$P(X > m) = 0.15$

$P\left(Z > \dfrac{m - 500}{85}\right) = 0.15$

$\dfrac{m - 500}{85} = 1.036$

$m = 588.06$



Markah minimum ialah 588.06. Markah Li Lian rendah daripada markah minimum, maka dia gagal diterima oleh universiti.

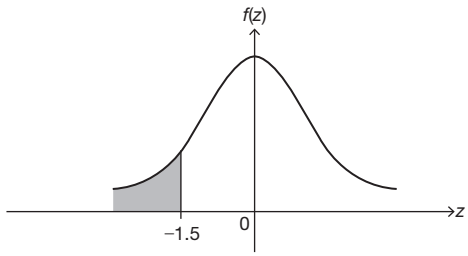
The minimum mark is 588.06. *Li Lian's mark is lower than the minimum mark, therefore she will not be admitted to this university.*

28 $X \sim N(12, 2^2)$

(a) $P(X < 9) = P\left(Z < \dfrac{9 - 12}{2}\right)$

$= P(Z < -1.5)$

$= 0.0668$

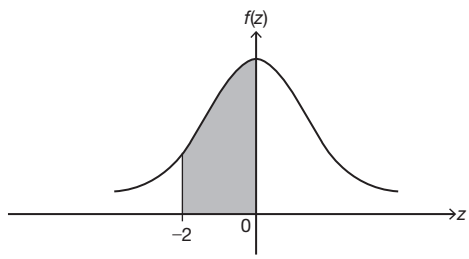


(b) $P(8 < X < 12) = P\left(\dfrac{8 - 12}{2} < Z < \dfrac{12 - 12}{2}\right)$

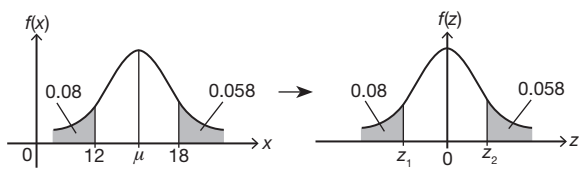
$= P(-2 < Z < 0)$

$= 0.5 - 0.0228$

$= 0.4772$



29 $X \sim N(\mu, \sigma^2)$



$P(X \leqslant 12) = 0.08$ $\quad P(X \geqslant 18) = 0.058$

$P\left(Z \leqslant \dfrac{12-\mu}{2}\right) = 0.08$ $\quad P\left(Z \geqslant \dfrac{18-\mu}{\sigma}\right) = 0.058$

$\dfrac{12-\mu}{\sigma} = -1.406$ $\quad \dfrac{18-\mu}{\sigma} = 1.572$

$\mu = 12 + 1.406\sigma \ldots$ ① $\quad \mu = 18 - 1.572\sigma \ldots$ ②

① = ②

$12 + 1.406\sigma = 18 - 1.572\sigma$

$2.978\sigma = 6$

$\sigma = 2.015$

Daripada/*From* ①, $\mu = 12 + 1.406(2.015)$

$= 14.83$

Praktis Sumatif

Kertas 1

1

x	0	1	2	3	4	5
$P(X = x)$	$\frac{1\,024}{3\,125}$	$\frac{256}{625}$	$\frac{128}{625}$	$\frac{32}{625}$	$\frac{4}{625}$	$\frac{1}{3\,125}$

$P(X > 2) = \dfrac{32}{625} + \dfrac{4}{625} + \dfrac{1}{3\,125}$

$= \dfrac{181}{3\,125}$

2 $p = \dfrac{8}{20}$

$= \dfrac{2}{5}$

$n = 12$

(a) Nilai jangkaan/*Expected value* $= np$

$= 12\left(\dfrac{2}{5}\right)$

$= 4.8$

(b) Varians/*Variance*, $\sigma^2 = npq$

$= 12\left(\dfrac{2}{5}\right)\left(\dfrac{3}{5}\right)$

$= 2.88$

3 $X \sim \text{B}(10, 0.3)$

(a) $P(X = 9) = {}^{10}C_9(0.3)^9(0.7)^1$

$= 0.00014$

(b) $P(X \leqslant 9) = 1 - P(X = 10)$

$= 1 - {}^{10}C_{10}(0.3)^{10}(0.7)^0$

$= 0.999994$

4 (a) $\mu = 0$

$\sigma = 1$

(b) $P(Z > 1) = 0.1578$

$\therefore P(Z < 1) = 1 - 0\ 1578$

$= 0.8422$

atau/*or*

$P(0 < Z < 1) = \dfrac{0.68}{2}$(Hukum 68-95-99.8 *rule*)

$\therefore P(Z < 1) = 0.5 + 0\ 34$

$= 0.84$

5 (a) $P(Z = 3) = 0.0244$

(b) $P(X \leqslant 2) = 0.4437 + 0.3915 + 0.1382$

$= 0.9734$

6 $X \sim \text{B}(8, 0.08)$

(a) $P(X = 0) = {}^{8}C_0(0.08)^0(0.92)^8$

$= 0.5132$

(b) $P(X < 2) = P(X = 0) + P(X = 1)$

$= {}^{8}C_0(0.08)^0(0.92)^8 + {}^{8}C_1(0.08)^1(0.92)^7$

$= 0.5132 + 0.3570$

$= 0.8702$

7 (a) $4k = 1 - (0.2373 + 0.3955 + 0.0146 + 0.0010)$

$k = \dfrac{1 - 0.6484}{4}$

$= 0.0879$

(b) $P(X = 0) = 0.2373$

${}^{5}C_0(p)^0(1-p)^5 = 0.2373$

$1 - p = \sqrt[5]{0.2373}$

$p = 0.25$

8 $X \sim \text{B}(20, 0.68)$

(a) Nilai jangkaan/*Expected number*, $\mu = np$

$= 20(0.68)$

$= 13.6$

(b) Sisihan piawai/*Standard deviation*,

$\sigma = \sqrt{npq}$

$= \sqrt{20(0.68)(0.32)}$

$= 4.352$

Kertas 2

1 (a) $X = \{x: x \in \mathbb{Z}, 0 \leqslant x \leqslant 20\}$

(atau senarai 0 hingga 20/*or list from* 0 *to* 20)

(b) X merupakan pemboleh ubah rawak yang bertaburan binomial kerana skesudahan setiap soalan ada 2 sahaja, iaitu betul atau salah. Kebarangkalian untuk menjawab soalan dengan betul adalah sama untuk setiap soalan dan tidak bergantung kepada kesudahan yang lepas.

X is a random variable that is binomially distributed because each question has only 2 *outcomes, which is either true or false. The probability to answer each question correctly is the same and it does not depend on the previous outcome.*

(c) $\mu = np$

$= 20\left(\dfrac{1}{4}\right)$

$= 5$

$\sigma = \sqrt{npq}$

$= \sqrt{20\left(\dfrac{1}{4}\right)\left(\dfrac{3}{4}\right)}$

$= 3.75$

(d) $X \sim \text{B}\left(10, \dfrac{1}{4}\right)$

Bilangan soalan minimum yang mesti dijawab dengan betul

The minimum number of questions must be answered correctly

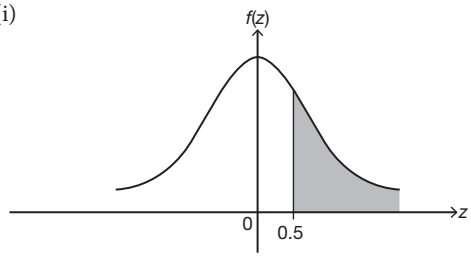
$= 80\% \times 20$

$= 16$

$$P(X \geqslant 6) = {}^{10}C_6\left(\frac{1}{4}\right)^6\left(\frac{3}{4}\right)^4 + {}^{10}C_7\left(\frac{1}{4}\right)^7\left(\frac{3}{4}\right)^3 + {}^{10}C_8\left(\frac{1}{4}\right)^8\left(\frac{3}{4}\right)^2 + {}^{10}C_9\left(\frac{1}{4}\right)^9\left(\frac{3}{4}\right)^1 + {}^{10}C_{10}\left(\frac{1}{4}\right)^{10}\left(\frac{3}{4}\right)^0$$
$$= 0.016222 + 0.00309 + 0.000386 + 0.00002861 + 0.000000953$$
$$= 0.01973$$

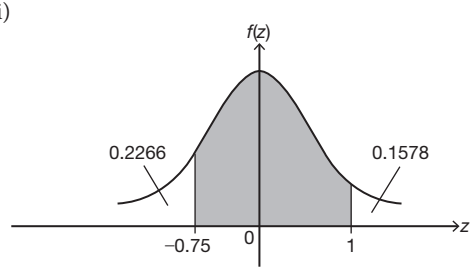
2 (a) $X \sim \mathrm{N}(13, 4)$

(i)

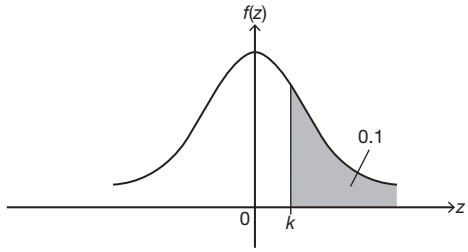


$$P(X > 14) = P\left(Z > \frac{14 - 13}{2}\right)$$
$$= P(Z > 0.5)$$
$$= 0.3085$$

(ii)



$$P(11.5 < X < 15)$$
$$= P\left(\frac{11.5 - 13}{2} < Z < \frac{15 - 13}{2}\right)$$
$$= P\,(-0.75 < Z < 1)$$
$$= 1 - 0.2266 - 0.1578$$
$$= 0.6156$$



$$P(X > k) = 0.1$$
$$P\left(Z > \frac{k - 13}{2}\right) = 0.1$$
$$\frac{k - 13}{2} = 1.281$$
$$k = 15.562$$

(b) $X \sim \mathrm{B}(5, 0.78)$

(i) $P(X = 5) = {}^5C_5(0.78)^5\,(0.22)^0$
$= 0.2887$

(ii) $P\,(X \geqslant 3) = {}^5C_3(0.78)^3\,(0.22)^2 + {}^5C_4(0.78)^4\,(0.22)^1 + {}^5C_5(0.78)^5\,(0.22)^0$
$= 0.2297 + 0.4072 + 0.2887$
$= 0.9256$