# Fully-worked Solutions

## Summative Assessment (*Ujian Akhir Sesi Akademik*)

### Section A

**1** 1, 2, 3, 5, 8, $m$, 21, $n$, 55, …

$3 = 1 + 2$

$5 = 2 + 3$

$8 = 3 + 5$

$m = 5 + 8$

$= 13$

$21 = 8 + 13$

$n = 13 + 21$

$= 34$

$55 = 21 + 34$

Answer: **C**

**2** $(2k + 7)(k - 2) - (k^2 + 4k - 2)$

$= 2k^2 + 3k - 14 - k^2 - 4k + 2$

$= k^2 - k - 12$

$= (k - 4)(k + 3)$

Answer: **A**

| | | |
|---|---|---|
| $k$ | $+3$ | $+3k$ |
| $k$ | $-4$ | $-4k$ |
| $k^2$ | $-12$ | $-k$ |

**3** $\dfrac{2}{r+3} - \dfrac{5}{3r-5} = \dfrac{2(3r-5) - 5(r+3)}{(r+3)(3r-5)}$

$= \dfrac{6r - 10 - 5r - 15}{(r+3)(3r-5)}$

$= \dfrac{r - 25}{(r+3)(3r-5)}$

Answer: **D**

**4** $p = \dfrac{2t + 13}{t - 8}$

$p(t - 8) = 2t + 13$

$pt - 8p = 2t + 13$

$pt - 2t = 8p + 13$

$t(p - 2) = 8p + 13$

$t = \dfrac{8p + 13}{p - 2}$

Answer: **C**

**5** Interior angle of hexagon $PQRSTU$

$= \dfrac{(6 - 2) \times 180°}{6}$

$= 120°$

$x = 180° - 120°$

$= 60°$

$\angle QPU = 120°$

$y = \dfrac{1}{2} \times (180° - 120°)$

$= 30°$

Answer: **B**

**6** Area of sector $ORS$ = Area of sector $OPR$

= Area of sector $OQS$

$= \dfrac{60°}{360°} \times \pi \times 6^2$

$= 6\pi \text{ cm}^2$

Area of shaded region $KPRL$

= Area of shaded region $QNMS$

$= \dfrac{60°}{360°} \times \pi \times 12^2 - 6\pi$

$= 24\pi - 6\pi$

$= 18\pi \text{ cm}^2$

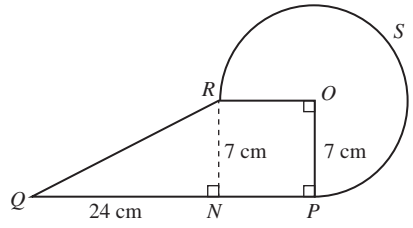
Area of shaded region

$= 18\pi + 18\pi + 6\pi$

$= 42\pi \text{ cm}^2$

Answer: **D**

**7**




$QR^2 = 24^2 + 7^2$

$= 625$

$QR = 25 \text{ cm}$

Length of arc $PSR$

$= \dfrac{270°}{360°} \times 2 \times \dfrac{22}{7} \times 7$

$= 33 \text{ cm}$

Perimeter of the whole diagram

$= 33 + 25 + 31$

$= 89 \text{ cm}$

Answer: **B**

**8** $GM^2 = 10^2 - 6^2$

$= 64$

$GM = 8 \text{ cm}$

Surface area of the composite solid

$= 2(12 \times 8) + 2(8 \times 4) + (12 \times 4) + (4 \times 4) + 2\left(\dfrac{1}{2} \times 6 \times 8\right) +$

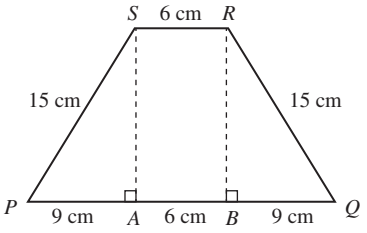
$(8 \times 6) + (8 \times 10) + (8 \times 4)$

$= 192 + 64 + 48 + 16 + 48 + 48 + 80 + 32$

$= 528 \text{ cm}^2$

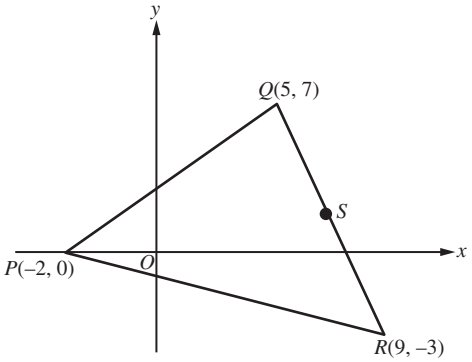
Answer: **D**

**9**




$RB^2 = 15^2 - 9^2$
$= 144$
$RB = 12$ cm
Volume of the remaining solid
$= \left[\frac{1}{2} \times (6 + 24) \times 12 \times 20\right] - \left[\frac{1}{2} \times \frac{22}{7} \times 7^2 \times 20\right]$
$= 3\,600 - 1\,540$
$= 2\,060\ \text{cm}^3$
Answer: **B**

**10**




Midpoint of $QR$, $S$
$= \left(\frac{5 + 9}{2}, \frac{7 - 3}{2}\right)$
$= (7, 2)$
Midpoint of $PS$
$= \left(\frac{-2 + 7}{2}, \frac{0 + 2}{2}\right)$
$= \left(\frac{5}{2}, 1\right)$
Answer: **B**

**11** **A** $y = x^2 - 3$
When $x = -2$, $y = (-2)^2 - 3$
$= 4 - 3$
$= 1$
When $x = 1$, $y = 1^2 - 3$
$= 1 - 3$
$= -2$
When $x = 4$, $y = 4^2 - 3$
$= 16 - 3$
$= 13$

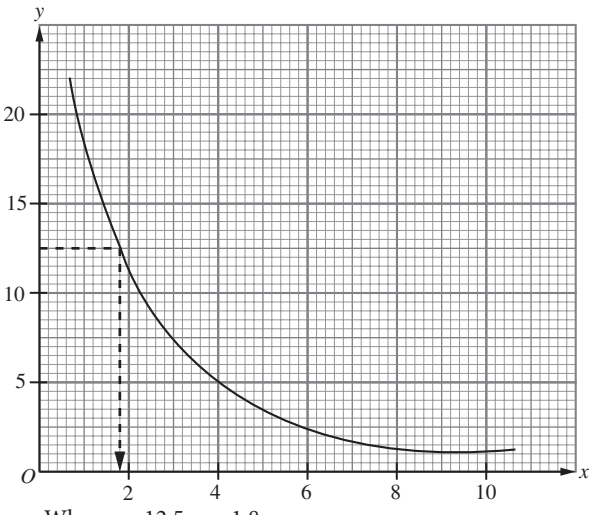
**B** $y = 5 - x^2$
When $x = -2$, $y = 5 - (-2)^2$
$= 5 - 4$
$= 1$
When $x = 1$, $y = 5 - 1^2$
$= 5 - 1$
$= 4$

**C** $y = 2x^2 - 1$
When $x = -2$, $y = 2(-2)^2 - 1$
$= 8 - 1$
$= 7$

**D** $y = 2x^2 - 4$
When $x = -2$, $y = 2(-2)^2 - 4$
$= 8 - 4$
$= 4$

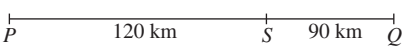
Answer: **A**

**12**



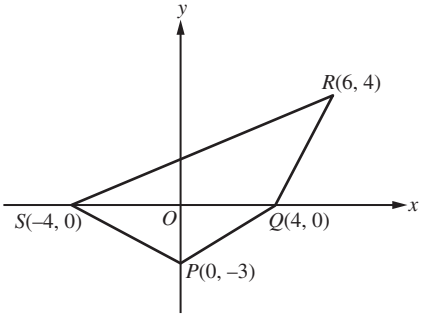

When $y = 12.5$, $x = 1.8$.
Answer: **C**

**13**




Total distance travelled
$= 120 + 90$
$= 210$ km
Total time taken
$= 2.5$ hours
Average speed
$= \frac{210}{2.5}$
$= 84$ km/h
Answer: **B**

**14**



Gradient of $PQ$

$= \frac{0+3}{4-0}$

$= \frac{3}{4}$

Gradient of $QR$

$= \frac{4-0}{6-4}$

$= \frac{4}{2}$

$= 2$

Gradient of $RS$

$= \frac{4-0}{6+4}$

$= \frac{4}{10}$

$= \frac{2}{5}$

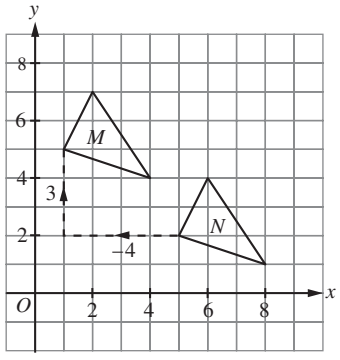
Gradient of $PS$

$= \frac{-3-0}{0+4}$

$= -\frac{3}{4}$

Answer: **D**

**15**

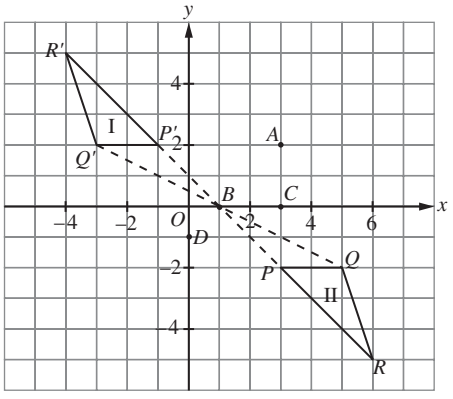



The translation is $\begin{pmatrix} -4 \\ 3 \end{pmatrix}$.

$p = -4$, $q = 3$

Answer: **A**

**16**




$\angle PBP' = \angle QBQ' = \angle RBR' = 180°$

The centre of the rotation is $B$.

Answer: **B**

**17**

| **Marks** | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| **Number of students** | 2 | $k$ | 4 | 6 | 2 |

If the modal mark = 2, $k > 6$.

$\therefore$ The smallest value of $k$ is 7.

Answer: **C**

**18** $\sum fx = 3(3) + 8(8) + 2(13) + 7(18) + 5(23)$

$= 9 + 64 + 26 + 126 + 115$

$= 340$

Mean $= \frac{340}{25}$

$= 13.6$ years

Answer: **B**

**19** $n(S) = 9$

$A$ = Event that a prime number is chosen

$= \{17, 31, 43\}$

$n(A) = 3$

$P(A) = \frac{n(A)}{n(S)}$

$= \frac{3}{9}$

$= \frac{1}{3}$

Answer: **C**

**20** $n(H) = x$

$n(S) = 10 + x$

$P(H) = \frac{n(H)}{n(S)}$

$\frac{x}{10+x} = \frac{2}{7}$

$7x = 2(10 + x)$

$7x = 20 + 2x$

$5x = 20$

$x = 4$

$\therefore$ Number of green apples is 4.

Answer: **A**

## Section B

**1** (a) $7 = 15 - 8 \times 1$

$-1 = 15 - 8 \times 2$

$-9 = 15 - 8 \times 3$

$-17 = 15 - 8 \times 4$

⋮

(b) The 25$^{th}$ term

$= 15 - 8 \times 25$

$= 15 - 200$

$= -185$

**2** (a) $\frac{k-1}{h-1} = \frac{1}{3}$

$3(k - 1) = h - 1$

$3k - 3 = h - 1$

$h = 3k - 2$

(b) (2, −3): $h = 2, k = -3$

$3k - 2 = 3(-3) - 2$

$= -9 - 2$

$= -11$

$h \neq 3k - 2$

$\therefore$ (2, −3) is not a possible coordinates of point *B*.

(4, 2): $h = 4, k = 2$

$3k - 2 = 3(2) - 2$

$= 6 - 2$

$= 4$

$h = 3k - 2$

$\therefore$ (4, 2) is a possible coordinates of point *B*.

(−5, −1): $h = -5, k = -1$

$3k - 2 = 3(-1) - 2$

$= -3 - 2$

$= -5$

$h = 3k - 2$

$\therefore$ (−5, −1) is a possible coordinates of point *B*.

**3** (a) (i) ✓

(ii) ✓

(iii) ✓

(b) 3, 7, 7, 9, 12, 15

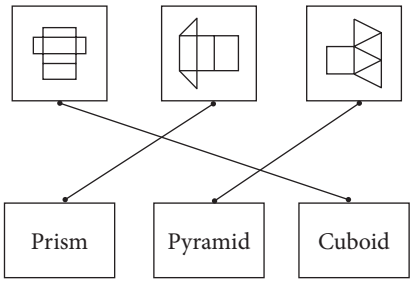
$\text{Median} = \frac{7 + 9}{2} = 8$

**4** (a) Many-to-one function

(b) Not a function

(c) Not a function, many-to-many relation

**5** (a)




(b) $x^2 + 2$

## Section C

**1** (a) (i) $h^2 - 2h + 1 = (h - 1)(h - 1) = (h - 1)^2$

$2h^2 - 7h + 5 = (2h - 5)(h - 1)$

(ii) $\frac{h^2 - 2h + 1}{2h^2 - 7h + 5} = \frac{(h - 1)^2}{(2h - 5)(h - 1)}$

$= \frac{h - 1}{2h - 5}$

(b) $\frac{6}{y} - \frac{y + 5}{y(2y^2 - 50)} = \frac{6}{y} - \frac{y + 5}{2y(y^2 - 25)}$

$= \frac{6}{y} - \frac{y + 5}{2y(y + 5)(y - 5)}$

$= \frac{6}{y} - \frac{1}{2y(y - 5)}$

$= \frac{12(y - 5) - 1}{2y(y - 5)}$

$= \frac{12y - 60 - 1}{2y(y - 5)}$

$= \frac{12y - 61}{2y(y - 5)}$

(c) (i) $r = \sqrt{\frac{1}{2}p + 4v}$

$r^2 = \frac{1}{2}p + 4v$

$\frac{1}{2}p = r^2 - 4v$

$p = 2(r^2 - 4v)$

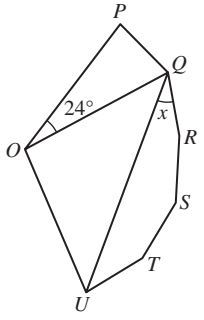
(ii) When $r = 4$, $v = 3\frac{1}{2}$

$p = 2\left[4^2 - 4\left(\frac{7}{2}\right)\right]$

$= 2(16 - 14)$

$= 4$

**2** (a) (i)




$n = \frac{360°}{24°}$

$= 15$

The number of sides of the regular polygon is 15.

(ii) Interior angle of regular polygon

$= \frac{(15 - 2) \times 180°}{15}$

$= 156°$

Sum of interior angles of polygon *QRSTU*

$= (5 - 2) \times 180°$

$= 540°$

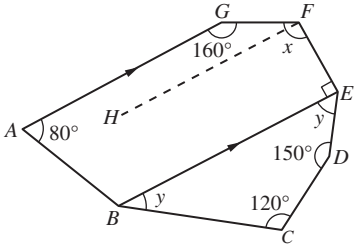
$x + x + 156° + 156° + 156° = 540°$

$2x + 468° = 540°$

$2x = 72°$

$x = 36°$

(b)

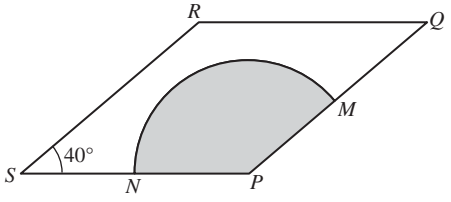



$\angle GFH = 180° - 160°$

$= 20°$

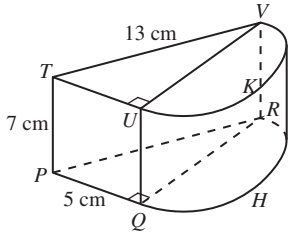
$\angle EFH = 180° - 90°$
$= 90°$
$x = 20° + 90°$
$= 110°$
$y + y + 120° + 150° = 360°$
$2y + 270° = 360°$
$2y = 90°$
$y = 45°$

(c)




$\angle QPS = 180° - 40°$
$= 140°$
Land area planted with brinjals
$= 3\,150 - \left(\frac{140°}{360°} \times \frac{22}{7} \times 35^2\right)$
$= 3\,150 - 1\,497.22$
$= 1\,652.78 \text{ m}^2$

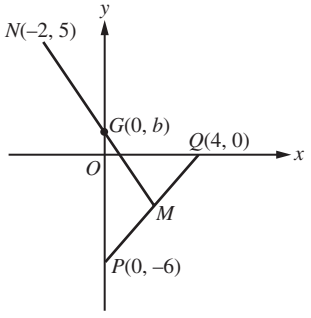
**3**




(a) (i) $UV^2 = 13^2 - 5^2$
$= 169 - 25$
$= 144$
$UV = 12$ cm
The diameter of the half cylinder is 12 cm.

(ii) Volume of the solid
$= \left(\frac{1}{2} \times \frac{22}{7} \times 6^2 \times 7\right) + \left(\frac{1}{2} \times 5 \times 12 \times 7\right)$
$= 396 + 210$
$= 606 \text{ cm}^3$

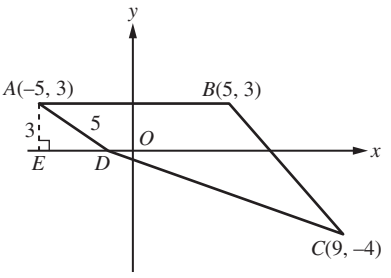
(b)




(i) The coordinates of point $M$
$= \left(\frac{0 + 4}{2}, \frac{-6 + 0}{2}\right)$
$= (2, -3)$

(ii) Gradient of $GM$ = Gradient of $MN$
$\frac{b + 3}{0 - 2} = \frac{-3 - 5}{2 + 2}$
$\frac{b + 3}{-2} = \frac{-8}{4}$
$\frac{b + 3}{-2} = -2$
$b + 3 = 4$
$b = 1$
$\therefore$ The $y$-intercept of the straight line $MN$ is 1.

(c)




(i) $AB = 2AD$
$10 = 2AD$
$AD = 5$ units
$DE = 4$ units
$OD = 5 - 4 = 1$ unit
The coordinates of point $D$ are $(-1, 0)$.

(ii) $CD = \sqrt{(9 + 1)^2 + (-4 - 0)^2}$
$= \sqrt{10^2 + (-4)^2}$
$= \sqrt{100 + 16}$
$= \sqrt{116}$
$= 10.8$ units

**4** (a) (i) 2.85 2.94 3.03 3.06 3.08 3.08 3.14 3.22
Median $= \frac{3.06 + 3.08}{2}$
$= 3.07$ kg

(ii) 2.85 2.94 3.03 3.06 3.08 3.08 3.14 3.22 3.47
Median = 3.08 kg
The median mass of the babies increases by 0.01 kg.

(b) 81 km/h
$= \frac{81\,000 \text{ m}}{3\,600 \text{ s}}$
$= 22.5$ m/s

$$\frac{v - 22.5}{30} = \frac{1}{4}$$

$$v - 22.5 = 7.5$$

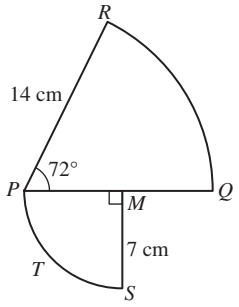
$$v = 30 \text{ m/s}$$

$$= \frac{\frac{30}{1\,000}\text{ km}}{\frac{1}{3\,600}\text{ h}}$$

$$= \frac{30}{1\,000} \times 3\,600 \text{ km/h}$$

$$= 108 \text{ km/h}$$

(c)



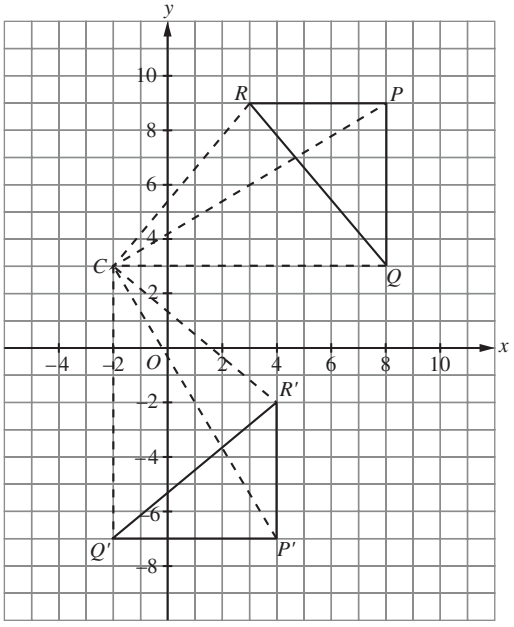

Perimeter of the whole diagram

$$= \frac{72°}{360°} \times 2 \times \frac{22}{7} \times 14 + \frac{1}{4} \times 2 \times \frac{22}{7} \times 7 + 14 + 7 + 7$$

$$= 17.6 + 11 + 28$$

$$= 56.6 \text{ cm}$$

**5** (a) (i)

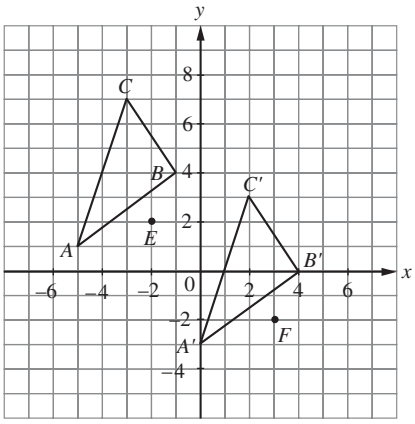



(ii) $\angle PCP' = \angle QCQ' = \angle RCR' = 90°$

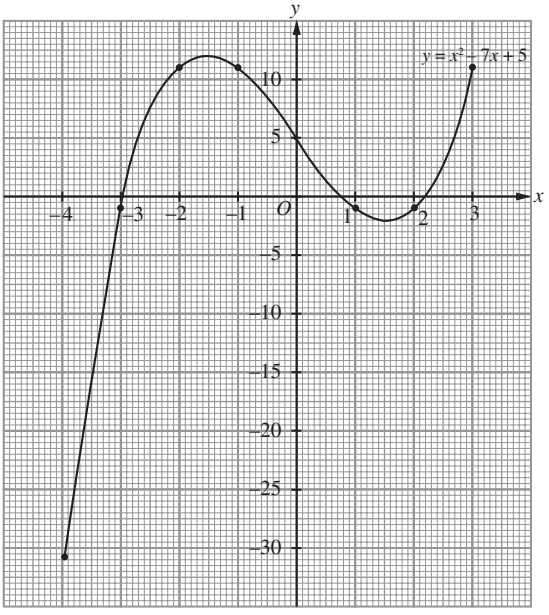
Angle of rotation = 90°

(b) (i) $\begin{pmatrix} 5 \\ -4 \end{pmatrix}$

(ii)




(c) (i)




(ii) When $x = 2.4$, $y = 2$.

$$y = x^3 - 7x + 5$$

$$2 = 2.4^3 - 7(2.4) + 5$$

$$2 = 2.4^3 - 11.8$$

$$2.4^3 = 13.8$$

**6** (a) (i) The modal class is 10 – 12.

(ii) $\sum fx = 10(2) + 9(5) + 6(8) + 15(11) + 8(14) + 2(17)$

$$= 20 + 45 + 48 + 165 + 112 + 34$$

$$= 424$$

$$\text{Mean} = \frac{424}{50} = 8.48 \text{ floors}$$

(b) $S = \{x : 1 \leqslant x < 30, x \text{ is an integer}\}$

$n(S) = 29$

(i) $A = \{1, 8, 27\}$

$n(A) = 3$

$$P(A) = \frac{n(A)}{n(S)}$$

$$= \frac{3}{29}$$

(ii) $B = \{3, 6, 9, 12, 15, 18, 21, 24, 27\}$

$n(B) = 9$

$P(B) = \frac{n(B)}{n(S)}$

$= \frac{9}{29}$

$P(B') = 1 - P(B)$

$= 1 - \frac{9}{29} = \frac{20}{29}$

(c) (i) {(A, S), (A, I), (A, N), (A, E), (R, S), (R, I), (R, N), (R, E), (C, S), (C, I), (C, N), (C, E)}

(ii) (a) $A$ = Event that the first card that is chosen is a vowel

= {(A, S), (A, I), (A, N), (A, E)}

$n(A) = 4$

$n(S) = 12$

$P(A) = \frac{n(A)}{n(S)}$

$= \frac{4}{12}$

$= \frac{1}{3}$

(b) $B$ = Event that at least a card that is chosen is a consonant

= {(A, S), (A, N), (R, S), (R, I), (R, N), (R, E), (C, S), (C, I), (C, N), (C, E)}

$n(B) = 10$

$P(B) = \frac{n(B)}{n(S)}$

$= \frac{10}{12}$

$= \frac{5}{6}$