Fully-Worked Solutions

Summative Assessment

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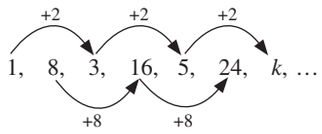
Section A

1



$k = 5 + 2 = 7$

Answer: **B**

2 $5p - 4q - 2(p - 3q) = 5p - 4q - 2p + 6q$
$= 5p - 2p - 4q + 6q$
$= 3p + 2q$

Answer: **A**

3 $\frac{2}{3m} - \frac{4n - 7}{6m} = \frac{4 - 4n + 7}{6m} = \frac{11 - 4n}{6m}$

Answer: **D**

4 $A = \frac{1}{2} \times \left(\frac{3}{2}x\right) \times [(3x - 11) + (x + 3)]$

$= \frac{3}{4}x(4x - 8) = 3x^2 - 6x$

Answer: **C**

5 Interior angle of pentagon

$= \frac{(5 - 2) \times 180°}{5}$

$= \frac{540°}{5} = 108°$

$\angle PTQ = \frac{1}{2}(180° - 108°) = 36°$

$x = 180° - 36° = 144°$

Answer: **A**

6 Exterior angle $= 180° - 156° = 24°$

Number of sides $= \frac{360°}{24°} = 15$

Answer: **D**

7 Area of sector $= \frac{45°}{360°} \times \frac{22}{7} \times 28 \times 28 = 308 \text{ cm}^2$

Area of triangle $OCD = \frac{1}{2} \times 16 \times 16 = 128 \text{ cm}^2$

$\therefore$ Area of shaded region
$= 308 - 128 = 180 \text{ cm}^2$

Answer: **C**

8 *Answer*: **C**

9 Volume of solid $= \left(\frac{1}{2} \times 8 \times 6 + \frac{1}{2} \times 3.142 \times 5^2\right) \times 12$
$= (24 + 39.275) \times 12$
$= 759.3 \text{ cm}^2$

Answer: **B**

10 $\sqrt{(-2 - 3)^2 + (k - 0)^2} = 13$
$(-5)^2 + k^2 = 13^2$
$25 + k^2 = 169$
$k^2 = 144$
$k = \pm 12$

Answer: **D**

11 Substitute $x = h$ and $y = -5$ into $y = \frac{9 - 2x}{3}$,

$-5 = \frac{9 - 2h}{3}$
$-15 = 9 - 2h$
$-2h = -24$
$h = 12$

Answer: **C**

12 Acceleration $= \frac{(30 - 84) \text{ km/h}}{20 \text{ s}}$

$= \frac{\frac{-54 \times 1\,000 \text{ m}}{3\,600 \text{ s}}}{20 \text{ s}}$

$= -0.75 \text{ m/s}^2$

Answer: **B**

13 Speed $= 84 \text{ km/h} - (8 \times 0.75) \text{ m/s}$

$= \left(84 - 6 \times \frac{3\,600}{1\,000}\right) \text{km/h}$

$= 84 - 21.6$

$= 62.4 \text{ km/h}$

Answer: **A**

14 Gradient of JK = Gradient of JL

$\frac{k - 4}{3 + 2} = \frac{-4 - 4}{18 + 2}$

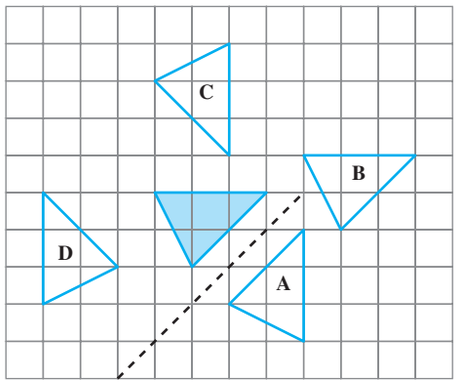
$k - 4 = \frac{-8}{20} \times 5$

$k = -2 + 4$

$k = 2$

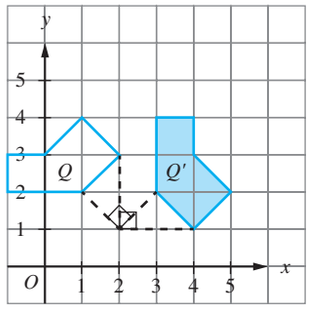
Answer: **D**

15



Answer: **A**

16



Answer: **D**

17 Total frequency = 3 + 3 + 2 + 5 + 2 + 1 = 16

$\frac{n}{2} = \frac{16}{2} = 8$

$\frac{n}{2} + 1 = \frac{16}{2} + 1 = 9$

$\therefore$ Median is the average of the values at the 8th and 9th positions.

Marks	4	5	6	7	8	9
Number of students	3	3	2	5	2	1
Position	1 – 3	4 – 6	7 – 8	9 – 13	14 – 15	16

$$\text{Median} = \frac{8^{\text{th}} \text{ value} + 9^{\text{th}} \text{ value}}{2}$$
$$= \frac{6 + 7}{2} = 6.5$$

Answer: **C**

18 $\frac{4 + 5 + 5 + x + 9}{5} = 6$

$x + 23 = 30$

$x = 7$

$$\text{Mean} = \frac{3 + 4 + 4 + 7 + 7}{5}$$
$$= \frac{25}{5} = 5$$

Answer: **B**

19 Sample space, $S = \{1, 2, 3, 4, \ldots, 15\}$

$n(S) = 15$

$N = \{\text{prime numbers from 1 to 15}\}$
$= \{2, 3, 5, 7, 11, 13\}$

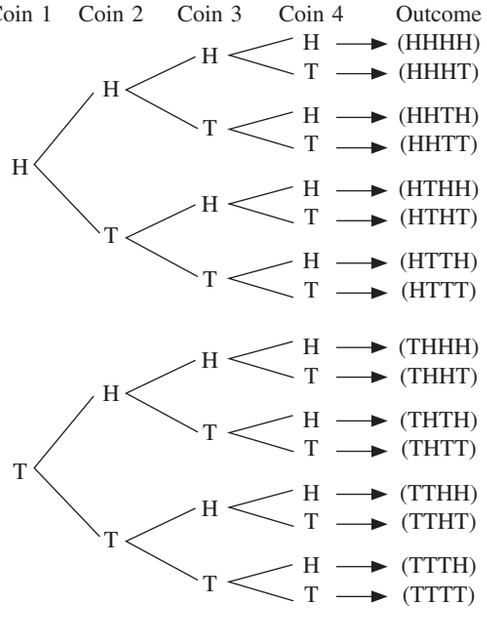
$n(N) = 6$

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

$= \frac{6}{15} = \frac{2}{5}$

Answer: **C**

20



$n(S) = 16$

$P(\text{at least one head}) = 1 - P(\text{all tails})$
$= 1 - P(\text{TTTT})$
$= 1 - \frac{1}{16}$
$= \frac{15}{16}$

Answer: **D**

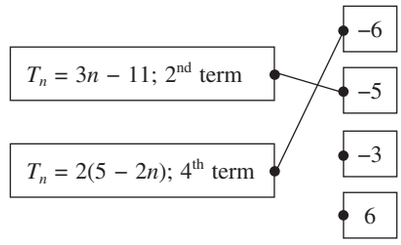
Section B

1 (a) $T_n = 3n - 11$

$T_2 = 3(2) - 11$
$= 6 - 11$
$= -5$

$T_n = 2(5 - 2n)$

$T_4 = 2[5 - 2(4)]$
$= 2(-3)$
$= -6$



(b) $p(p - 4q) + q(p - 10q) = p^2 - 4pq + pq - 10q^2$
$= p^2 - 3pq - 10q^2$
$= (p - 5q)(p + 2q)$

$(p - 5q)$	✓	$(p - 2q)$	
$(p + 5q)$		$(p + 2q)$	✓

2 (a)

	Statements	**TRUE or FALSE**
(i)	The variable p is the subject of the formula $3q - r = 2p$.	FALSE
(ii)	The variable m is the subject of the formula $m = \sqrt{k^2 - 2n}$.	TRUE

(b)

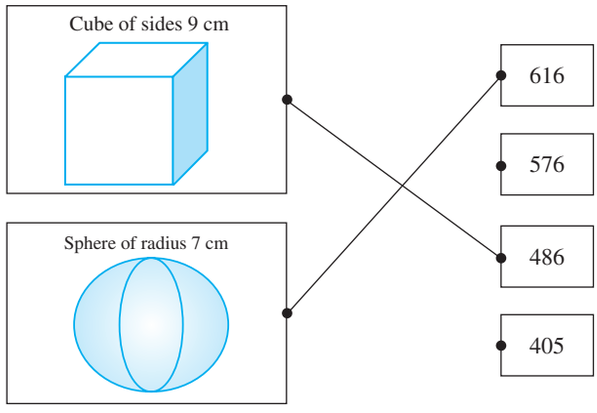
Pentagon	5	Octagon	8

3 (a)

Description	Point where perpendicular bisectors of two chords intersect	as	Axis of symmetry	as	Region enclosed by an arc and a chord
Part	Centre		Diameter		Segment

(b) Surface area of cube = $6(l \times w)$
$= 6 \times (9 \times 9)$
$= 486 \text{ cm}^2$

Surface area of sphere = $4\pi r^2$
$= 4 \times \frac{22}{7} \times 7 \times 7$
$= 616 \text{ cm}^2$



4 (a) $(h, 1) = \left(\frac{-3 + 11}{2}, \frac{9 + k}{2}\right)$

Compare both sides,

$h = \frac{-3 + 11}{2}$

$= \frac{8}{2}$

$= 4$

$$\frac{9+k}{2} = 1$$
$$9 + k = 2$$
$$k = -7$$

(b) (i) If gradient of $PQ = 0$, then
$$m - (-8) = 0$$
$$m = -8$$

(ii) If the gradient of PQ is undefined, then
$$2m - 4 = 0$$
$$2m = 4$$
$$m = 2$$

5 (a) (i) Let the coordinates of the image be (x', y').
$$\begin{pmatrix} x' \\ y' \end{pmatrix} = \begin{pmatrix} x \\ y \end{pmatrix} + \begin{pmatrix} a \\ b \end{pmatrix}$$
$$= \begin{pmatrix} 3 \\ -5 \end{pmatrix} + \begin{pmatrix} 4 \\ -6 \end{pmatrix}$$
$$= \begin{pmatrix} 7 \\ -11 \end{pmatrix}$$

(1, 1)	(7, −1)	**(7, −11)**

(ii) If the coordinates of an object is (x, y), then the coordinates of the image formed under an anticlockwise rotation of 90° about the origin is $(-y, x)$. Thus, the image of $R(-2, 0)$ formed under an anticlockwise rotation of 90° about the origin:

$R(-2, 0) \rightarrow R'(0, -2)$

(0, 2)	**(0, −2)**	(2, −2)

(b)

Dice 1 / Dice 2	1	2	3	4	5	6
1	(1, 1)	(2, 1)	(3, 1)	(4, 1)	(5, 1)	(6, 1)
2	(1, 2)	(2, 2)	(3, 2)	(4, 2)	(5, 2)	(6, 2)
3	(1, 3)	(2, 3)	(3, 3)	(4, 3)	(5, 3)	(6, 3)
4	(1, 4)	(2, 4)	(3, 4)	(4, 4)	(5, 4)	(6, 4)
5	(1, 5)	(2, 5)	(3, 5)	(4, 5)	(5, 5)	(6, 5)
6	(1, 6)	(2, 6)	(3, 6)	(4, 6)	(5, 6)	(6, 6)

$n(S) = 36$

X = {getting a '6' from the second throw}
= {(1, 6), (2, 6), (3, 6), (4, 6), (5, 6), (6, 6)}

$n(X) = 6$

$$P(X) = \frac{n(X)}{n(S)}$$
$$= \frac{6}{36}$$
$$= \frac{1}{6} \quad [\checkmark]$$

Y = {the sum of the two numbers is 4}
= {(1, 3), (2, 2), (3, 1)}

$n(Y) = 3$

$$P(Y) = \frac{n(X)}{n(S)}$$
$$= \frac{3}{36}$$
$$= \frac{1}{12} \quad [\times]$$

	Statements	(✓) or (✗)
(i)	The probability of getting a '6' from the second throw is $\frac{1}{6}$.	✓
(ii)	The probability that the sum of the two numbers is 4 is $\frac{1}{18}$.	✗

Section C

1 (a) (i) +8 +8 +8 +8 +8
5, 13, 21, 29, x, 45, …
$x = 29 + 8 = 37$

(ii) $T_1 = 5 + 8(0)$
$T_2 = 5 + 8(1)$
$T_n = 5 + 8(n - 1) = 8n - 3$, $n = 0, 1, 2, \ldots$

(b) (i) $$\frac{3a}{a-2b} - \frac{6ab}{a^2-4b^2} = \frac{3a(a+2b)}{(a-2b)(a+2b)} - \frac{6ab}{(a-2b)(a+2b)}$$
$$= \frac{3a^2 + 6ab - 6ab}{(a-2b)(a+2b)}$$
$$= \frac{3a^2}{(a-2b)(a+2b)}$$

(ii) $$\frac{2p+3q}{4p^2-pq} \div \frac{6p+9q}{2q-8p} = \frac{2p+3q}{p(4p-q)} \times \frac{-2(4p-q)}{3(2p+3q)}$$
$$= -\frac{2}{3p}$$

(c) $$\sqrt{\frac{2g-5h}{3}} = 2f$$
$$\frac{2g-5h}{3} = (2f)^2$$
$$2g - 5h = 3 \times 4f^2$$
$$g = \frac{12f^2 + 5h}{2}$$

2 (a) (i) In the regular hexagon, $OC = OD = CD$, thus OCD is an equilateral triangle.
$$\therefore p = \frac{180°}{3} = 60°$$
Interior angles of hexagon $= \frac{(6-2) \times 180°}{6} = 120°$
$\therefore \angle AFE = 120°$
Since $\angle AFD = 90°$, $q = 120° - 90° = 30°$

(ii) $x = 180° - 105° = 75°$
Sum of interior angles of a pentagon
$= (5 - 2) \times 180° = 540°$
$$3(180° - y) + 180° = 540°$$
$$540° - 3y + 180° = 540°$$
$$3y = 180°$$
$$y = 60°$$

(b) Circumference of the wheel $= 2 \times \frac{22}{7} \times 42$
$= 264$ cm
$= 2.64$ m
Number of complete rotations $= \frac{132}{2.64} = 50$

(c) (i) $$DF = \frac{90°}{360°} \times 2 \times \frac{22}{7} \times \left(\frac{42}{3}\right)$$
$$= \frac{1}{4} \times 2 \times \frac{22}{7} \times 14$$
$= 22$ cm

(ii) Perimeter $= AB + AE + ED +$ arc $DF + FC +$ arc CGB
$= 14 + 42 + 14 + 22 + 14 + (2 \times 22)$
$= 150$ cm

3 (a) $\frac{22}{7} \times 1.75 \times 1.75 \times h = 3.5 \times 4 \times 11$

$$\frac{77}{8}h = 154$$

$$h = 154 \times \frac{8}{77}$$

$$= 16 \text{ cm}$$

(b) (i) Midpoint of $PQ = \left(\frac{4+1}{2}, \frac{8+2}{2}\right)$

$$= \left(\frac{5}{2}, 5\right)$$

(ii) $QR = \sqrt{(4-1)^2 + (-2-2)^2}$

$= \sqrt{9+16}$

$= \sqrt{25}$

$= 5$ units

(iii) Vertex S since

$OS = \sqrt{(12-0)^2 + (5-0)^2}$

$= \sqrt{169}$

$= 13$ units

(c) (i) $AB = \sqrt{(-2-0)^2 + (5+1)^2} = \sqrt{40}$ units

$AC = \sqrt{(-2-4)^2 + (5-3)^2} = \sqrt{40}$ units

$BC = \sqrt{(4-0)^2 + (3+1)^2} = \sqrt{32}$ units

$\therefore$ AB and AC are equal in length

(ii) Midpoint of $BC = \left(\frac{4+1}{2}, \frac{-1+3}{2}\right) = (2, 1)$

Height of $ABC = \sqrt{(-2-2)^2 + (5-1)^2} = \sqrt{32}$ units

Area of $ABC = \frac{1}{2} \times BC \times$ height

$$= \frac{1}{2} \times \sqrt{32} \times \sqrt{32}$$

$$= 16 \text{ units}^2$$

4 (a) $y = ax + b$

At $(-1, -7)$, $-7 = -a + b$ … ①

At $(1, -1)$, $-1 = a + b$ … ②

① + ②: $-8 = 2b$

$b = -4$

From ②, $-1 = a - 4$

$a = 3$

$\therefore$ The function is $y = 3x - 4$

(b) $y = (x + 2)(x - 7)$

When the graph intersects the y-axis, $x = 0$

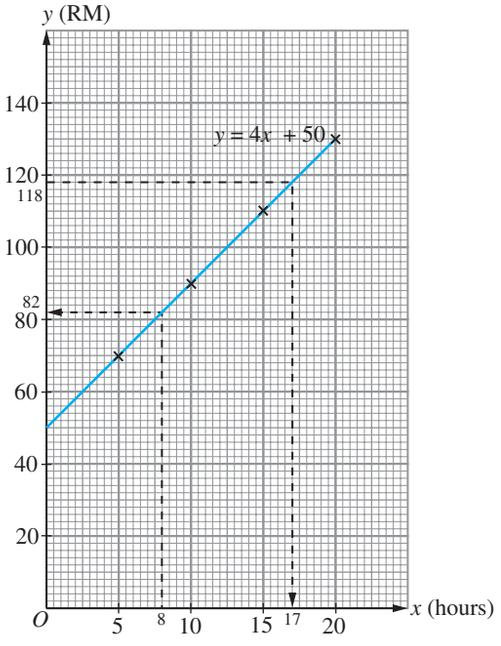
$k = (0 + 2)(0 - 7)$

$k = -14$

(c) (i) $y = 4x + 50$ where x represents the rental time

x (hours)	0	5	10	15	20
y (RM)	50	70	90	110	130

(ii)



(iii) (a) When $x = 8$ hours, $y =$ RM82

(b) When $y =$ RM118, $x = 17$ hours

5 (a) Acceleration $= \frac{108 - 0 \text{ km/h}}{\frac{5}{4} \text{ minutes}}$

$$= \frac{\frac{108 \times 1\,000 \text{ m}}{60 \times 60 \text{ s}}}{\frac{5}{4} \times 60 \text{ s}}$$

$$= \frac{30 \text{ m/s}}{75 \text{ s}}$$

$$= 0.4 \text{ m/s}^2$$

(b) (i) 0950 − 0830 = 1 hour 20 minutes $= \frac{4}{3}$ hours

Speed $= \frac{120 \text{ km}}{\frac{4}{3} \text{ hours}}$

$$= 120 \times \frac{3}{4}$$

$$= 90 \text{ km/h}$$

(ii) 0950 + 0058 = 1048

1218 − 1048 = 1 hour 30 minutes $= \frac{3}{2}$ hours

Speed $= \frac{108 \text{ km}}{1\frac{1}{2} \text{ hours}}$

$$= 108 \times \frac{2}{3}$$

$$= 72 \text{ km/h}$$

(iii) Total distance travelled = 120 + 108 = 228 km

Total time taken $= \frac{4}{3} + \frac{3}{2} + \frac{58}{60} = \frac{19}{5}$ hours

Average speed $= \frac{228 \text{ km}}{\frac{19}{5} \text{ hours}}$

$$= 128 \times \frac{5}{19}$$

$$= 60 \text{ km/h}$$

(c) (i) 1 m/s

(ii) 20 − 60

(iii) Acceleration $= \dfrac{6 - 2 \text{ m/s}}{80 - 60 \text{ s}}$

$= \dfrac{4}{20}$

$= 0.2 \text{ m/s}^2$

6 (a) (i) Mode = Size of shoe worn by the most number of students
= Size 6

(ii) Median = Size of shoe worn by the $\left(\dfrac{15 + 1}{2}\right)^{\text{th}}$ student
= Size 7

(iii) Probability $= \dfrac{3}{15} = \dfrac{1}{5}$

(b) (i) 3, 4, 6, 6, 9, 10, 10, 12, x, y

If mode = 6, then $x = 6$
[since number 10 occurs twice too]

3, 4, 6, 6, 6, 9, 10, 10, 12

If median = 7, then $y = 8$ [since $\dfrac{6 + 8}{2} = 7$]

(ii) Total mass of students = $50.25 \times 40 = 2\,010$ kg

Total mass of boys = $2\,010 - 44 \times 15 = 1\,350$ kg

Mean mass of boys $\dfrac{1\,350}{25} = 54$ kg

(c) Sample space, S = {11, 14, 15, 19, 41, 44, 45, 49, 51, 54, 55, 59, 91, 94, 95, 99}

$n(S) = 16$

(i) Set of prime numbers = {11, 19, 41, 59}

n(set of prime numbers) = 4

Probability $= \dfrac{4}{16} = \dfrac{1}{4}$

(ii) Set of numbers divisible by 3 = {15, 45, 51, 54, 99}

Probability $= \dfrac{5}{16}$