



basic education

Department:
Basic Education
REPUBLIC OF SOUTH AFRICA

GEC PILOT STUDY MARKING GUIDELINE 2022 MATHEMATICS: ENGLISH GRADE 9

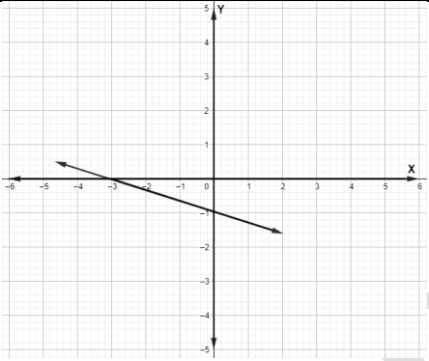
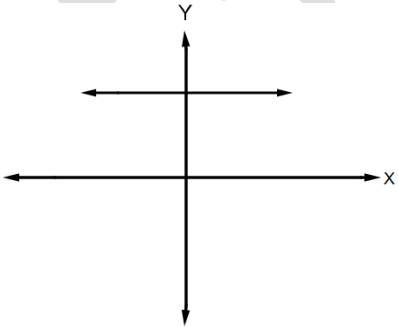
SECTION A

- One mark per answer.
- There are no half marks.
- Tick (✓) only the correct answer and underline the incorrect one.
- No marks should be credited for multiple answers. Underline them all.
- If there is no answer indicated, skip the question

No.	Expected answer	Option
1.	An irrational number	D
2.	$14 = 2 \times 7$ $16 = 2 \times 2 \times 2 \times 2$ $\therefore \text{LCM} = 2 \times 2 \times 2 \times 2 \times 7$ $= 112$	B
3.	$s = \frac{d}{t}$ $s = \frac{180}{2} = 90 \text{ km/h}$ $t = \frac{210}{60} = 3,5 \text{ h}$ $d = s \times t$ $d = 90 \times 3,5 = 315 \text{ km}$	D
4.	$= 3[-(14)] + 4 \times 2$ $= -42 + 8$ $= -34$	D
5.	$= \frac{3(-2(2) \times 3) + 6(2)^2(3)^2}{2 \times 3}$ $= \frac{3(-12) + 216}{6}$ $= \frac{180}{6}$ $= 30$	B

No.	Expected answer	Option																								
6.	$\begin{aligned} &= \frac{-64}{2 \times 2} + \frac{8}{2} - 4 \\ &= -16 + 4 - 4 \\ &= -16 \end{aligned}$	A																								
7.	$\begin{aligned} &= a^{12-3} \\ &= a^9 \end{aligned}$	B																								
8.	$\begin{aligned} &= \frac{\frac{1}{5} + \frac{1}{6}}{\frac{1}{5} \times \frac{1}{6}} = \frac{\frac{11}{30}}{\frac{1}{30}} = \frac{11}{30} \times \frac{30}{1} = 11 \end{aligned}$	D																								
9.	$\begin{aligned} &= 2^3(x^5)^6 \\ &= 8x^{30} \end{aligned}$	D																								
10.	$\begin{aligned} &= 1 - 1 + 5^6 \div 5^6 \\ &= 1 - 1 + 1 = 1 \end{aligned}$	A																								
11.	25 <table border="1"><tr><td>Figure</td><td>1</td><td>2</td><td>3</td><td>4</td></tr><tr><td>Dots</td><td>7</td><td>13</td><td>19</td><td>25</td></tr></table>	Figure	1	2	3	4	Dots	7	13	19	25	C														
Figure	1	2	3	4																						
Dots	7	13	19	25																						
12.	$\frac{T_5}{T_4} = \frac{T_4}{T_3} = \frac{T_3}{T_2} = \frac{T_2}{T_1}$ $a = 16 \text{ and } b = \frac{1}{16}$	C																								
13.	<table border="1"><tr><td>Arrangement</td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td></tr><tr><td>No of tables</td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td></tr><tr><td>No of people</td><td>4</td><td>8</td><td>8</td><td>16</td><td>12</td><td>24</td><td>16</td></tr></table> <p>Sequence 1: Arrangement 1; Arrangement 3 Arrangement 5; ...</p> <p>Sequence 2: Arrangement 2; Arrangement 4; Arrangement 6;...</p> <p>The rule for the 7th arrangement is 4n.</p>	Arrangement	1	2	3	4	5	6	7	No of tables	1	2	3	4	5	6	7	No of people	4	8	8	16	12	24	16	B
Arrangement	1	2	3	4	5	6	7																			
No of tables	1	2	3	4	5	6	7																			
No of people	4	8	8	16	12	24	16																			
14.	10 handshakes	A																								
15.	$-\frac{1}{4}$	C																								
16.	$7xay + 3axy$	D																								
17.	$x^2 + 7xy - 15y^2$	A																								

No.	Expected answer	Option
18.	$= \frac{16x^3 + 8x^2}{-2x^2}$ $= \frac{8x^2(2x + 1)}{-2x^2}$ $= -4(2x + 1)$ $= -8x - 4$	D
19.	$= (1 - 3a)(1 + 3a)$	B
20.	$= 3x(x^2 + 3x - 10)$ $= 3x(x + 5)(x - 2)$	D
21.	$L = (x + 1)$ and $W = (x - 2)$	D
22.	$= \frac{6(x^2 + 3x - 10)}{48x} \times \frac{8x}{x^2 - 4}$ $= \frac{6(x + 5)(x - 2)}{48x} \times \frac{8x}{(x - 2)(x + 2)}$ $= \frac{(x + 5)}{(x + 2)}$	C
23.	$= 15(s^4 - z^4)$ $= 15(s^2 - z^2)(s^2 + z^2)$ $= 15(s - z)(s + z)(s^2 + z^2)$	C
24.	$x - 5 = -7$ $x = -2$	C
25.	$3x + 1 = 10$ $3x = 9$ $x = 3$	D
26.	$x = 0$ or $x = 4$	B
27.	$6^{x-1} = 6^2$ $\therefore x - 1 = 2$ $x = 3$	B
28.	$-6 = 12x - 18$ $12 = 12x$ $x = 1$	B
29.	$y = x^2 + c$ $a = (-1)^2 + 2$ $a = 3$	A
30.	$3x(6x - 8) = 0$ $3x = 0$ or $6x - 8 = 0$ $x = 0$ or $x = \frac{4}{3}$	D
31.	$4x^2 - 4x - 48 = 0 \dots (\div 4)$ $x^2 - x - 12 = 0$ $(x + 3)(x - 4) = 0$ $x = -3$ or $x = 4$	D

No.	Expected answer	Option
32.	$d^2 = l^2 + w^2 \dots \text{Theor. of Pyth.}$ $(w + 9)^2 = (w + 7)^2 + w^2$ $w^2 + 18w + 81 = w^2 + 14w + 49 + w^2$ $w^2 - 4w - 32 = 0$ $(w - 8)(w + 4) = 0$ $w \neq -4 \text{ or } w = 8$ $l = 8 + 7 = 15$ $A = l \times b$ $= 15 \times 8$ $= 120 \text{ cm}^2$	A
33.	$y = -2x - 4$	D
34.	 $y = -\frac{1}{3}x - 1$ $c = -1$ $m = -\frac{1}{3}$	D
35.	<p>Rule: $y = x^2 + 2$</p> $258 = z^2 + 2$ $z^2 = 256$ $z = 16$	C
36.	 <p>y-values are all equal to 4, which implies that the horizontal line is above the X-axis.</p>	A

No.	Expected answer	Option
37.	$y = mx + c$ $y = mx + 4$ $0 = -3m + 4$ $3m = 4$ $m = \frac{4}{3}$ $\therefore y = \frac{4}{3}x + 4$ $y = \frac{4}{3}(-2) + 4$ $y = \frac{-8}{3} + 4$ $y = \frac{4}{3}$ $\therefore (-2; \frac{4}{3})$ lies on the graph (The learner may test different values to check which points lie on the graph. y –intercept eliminates options B and D)	C
38.	$y = 2x - 8$ (Line AB) $\therefore y = -\frac{1}{2}x + c$ $4 = -\frac{1}{2}(-2) + c$ $c = 3$ $\therefore y = -\frac{1}{2}x + 3$	D
39.	$A'(-3; -5)$	B
40.	$(x; y) \longrightarrow (-x; y)$	A
41.	Translated 5 units up	A
42.	90°	B
43.	80°	A
44.	Alternate angles $AB \parallel CD$	A
45.	$\widehat{AOC} = \widehat{BOD}$ Vertically Opp. $\angle s =$ $3x - 5^\circ = x + 25^\circ$ $3x - x = 25^\circ + 5^\circ$ $2x = 30^\circ$ $x = 15^\circ$ $\therefore \widehat{AOC} = 3x - 5^\circ$ $= 3(15^\circ) - 5^\circ$ $= 45^\circ - 5^\circ$ $= 40^\circ$	D
46.	$\widehat{BOD} = 90^\circ$ $AD \perp BE$, $x + 5^\circ + 35^\circ = 90^\circ \dots \angle s$ on a str. line $\therefore x = 50^\circ$	D

No.	Expected answer	Option
47.	Two angles opposite equal sides are equal.	D
48.	<div style="display: flex; justify-content: space-between;"> <div style="width: 48%;"> <p> $\widehat{MGH} = \widehat{GMH} = \widehat{GHM} = 60^\circ$ $\angle s$ of equilat. Δ $\widehat{GHD} + \widehat{GHM} = 180^\circ$ $\angle s$ on a str. line $\widehat{GHD} = 120^\circ$ $\widehat{EGB} = \widehat{GHD}$ Corr. $\angle s$, $AB \parallel CD$ $4y + 20^\circ = 120^\circ$ $4y = 100^\circ$ $\therefore y = \frac{100}{4}$ $= 25^\circ$ </p> <p>OR</p> <p> $\widehat{MGH} = \widehat{GMH} = \widehat{GHM} = 60^\circ$ $\angle s$ of equilat. Δ $\widehat{BGH} = \widehat{GMH} = 60^\circ \dots$ Alt. $\angle s$, $AB \parallel CD$ $4y + 20^\circ + 60^\circ = 180^\circ \dots \angle s$ on a str $4y + 20^\circ = 120^\circ$ $4y = 100^\circ$ $\therefore y = \frac{100}{4}$ $= 25^\circ$ </p> </div> <div style="width: 48%;"> <p>OR</p> <p> $\widehat{AGM} = \widehat{GMH} = 60^\circ$ Alt. $\angle s$, $AB \parallel CD$ $\widehat{AGH} = \widehat{AGM} + \widehat{MGH}^\circ$ $= 60^\circ + 60^\circ$ $= 120^\circ$ $\widehat{AGH} = \widehat{EGB}$ Vert. opp. $\angle s$ $4y + 20^\circ = 120^\circ$ $4y = 100^\circ$ $\therefore y = \frac{100}{4}$ $= 25^\circ$ </p> </div> </div>	

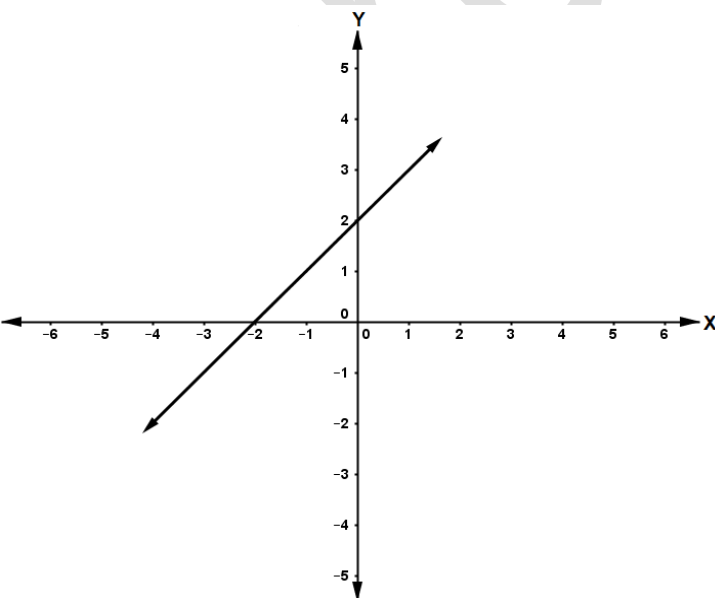
No.	Expected answer		Option
49.	<p>In $\triangle EFG$ and $\triangle ABC$</p> $\frac{EF}{AB} = \frac{FG}{BC} = \frac{EG}{AC}$ $\frac{12 \text{ cm}}{6 \text{ cm}} = \frac{4 \text{ cm}}{2 \text{ cm}} = \frac{8 \text{ cm}}{4 \text{ cm}} = 2$ <p>$\therefore \triangle EFG \parallel \triangle ABC$ Corr. Sides are proportional</p> $\angle C = \angle F = 86^\circ$ $\hat{B}_1 = \hat{F} = 58^\circ$ <p>$\therefore \hat{A} = \hat{E}_2$ corr.</p> <p>$\angle s$ of similar $\triangle =$ $= 36^\circ$</p> $\hat{E}_1 = \hat{A}$ $= 36^\circ$ <p>alter. $\angle s$ $DE \parallel AC$</p>	<p>OR</p> <p>In $\triangle EFG$ and $\triangle ABC$</p> $\frac{EF}{AB} = \frac{FG}{BC} = \frac{EG}{AC}$ $\frac{12 \text{ cm}}{6 \text{ cm}} = \frac{4 \text{ cm}}{2 \text{ cm}} = \frac{8 \text{ cm}}{4 \text{ cm}} = 2$ <p>$\therefore \triangle EFG \parallel \triangle ABC$ Corr. Sides are proportional</p> $\hat{B}_1 = \hat{F} \text{ corr. } \dots \angle s \text{ of similar } \triangle s$ $\hat{B}_1 = 58^\circ$ $\hat{A} + \hat{B}_1 + \hat{C} = 180^\circ \dots \text{sum of } \angle s \text{ of } \triangle$ $\hat{A} + 58^\circ + 86^\circ = 180^\circ$ $\hat{A} = 180^\circ - 144^\circ$ $\hat{A} = 36^\circ$ $\hat{E}_1 = \hat{A} \text{ alter. } \dots \angle s = DE \parallel AC$ $\hat{E}_1 = 36^\circ$	A
50.	<p>$\hat{B}_2 = \hat{B}_1 = 42^\circ$ diagonals of rhombus bisect $\angle s$</p> $\angle ABC = 84^\circ$ <p>$\angle ABC + \angle BCD = 180^\circ$ Co-int $\angle s$ $AB \parallel CD$</p> $84^\circ + \angle BCD = 180^\circ$ $\angle BCD = 96^\circ$ $\angle BCD = \angle BCA + \angle ACD$ $96^\circ = \angle BCA + \angle ACD$ <p>But $\angle BCA = \angle ACD$ diagonals of rhombus bisect $\angle s$</p> $\therefore 96^\circ = 2\angle ACD$ $\angle ACD = 48^\circ$		C
51.	<p>$\hat{F}_2 = \hat{B}_1 = 68^\circ$ Alt $\angle s$ $AB \parallel CD$</p> <p>$\hat{E}_2 + \hat{B}_1 = 180^\circ$ Co-int $\angle s$ $ED \parallel BF$</p> $\hat{E}_2 + 68^\circ = 180^\circ$ $\hat{E}_2 = 112^\circ$ <p>$\hat{A} + \hat{D}_1 = \hat{E}_2$ Ext \angle of \triangle</p> $\hat{A} + \hat{D}_1 = 112^\circ$ <p>But $\hat{A} = \hat{D}_1$ $\angle s$ opp equal sides</p> $\therefore 2\hat{A} = 112^\circ$ $\hat{A} = 56^\circ$	<p>OR</p> <p>$\hat{B}_1 = \hat{E}_1 = 68^\circ \dots$ Corr. $\angle s$ $ED \parallel BF$</p> $\hat{A} + \hat{D}_1 + \hat{E}_1 = 180^\circ \dots \angle s \text{ of } \triangle$ $\hat{A} + \hat{D}_1 + 68^\circ = 180^\circ$ $\hat{A} + \hat{D}_1 = 112^\circ$ <p>But $\hat{A} = \hat{D}_1 \dots \angle s$ opp equal sides</p> $\therefore \hat{A} = 56^\circ$	A
52.	<p>$AC^2 = AB^2 + BC^2 \dots$ Theor. Of Pyth.</p> $= (15 \text{ cm})^2 + (8 \text{ cm})^2$ $= 225 \text{ cm}^2 + 64 \text{ cm}^2$ $= 289 \text{ cm}^2$ <p>$AC = 17 \text{ cm}$</p>		C

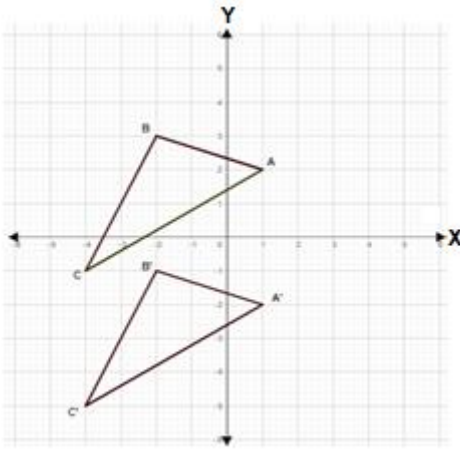
No.	Expected answer	Option
53.	$P = 2(l + b) = 40$ $l + b = 20$ For maximum area: $l = b = 10$ $\therefore A = l^2$ $= 10^2$ $= 100$ Using different combinations other 10 gives smaller area. e.g. $A = 9 \times 11 = 99 \text{ cm}^2$ $A = 8 \times 12 = 96 \text{ cm}^2$	C
54.	For 2 smaller rectangles $AB = (5 \div 10 = \frac{1}{2}) \text{ cm}$ $BC = 4 \text{ cm}$ $\therefore \text{area} = \frac{1}{2} \times 4 = 2 \text{ cm}^2$	B
55.	$A = \pi r^2 = 36\pi$ $\therefore r^2 = 36$ $r = 6$ $C = 2\pi r$ $= 2 \times 6 \times \pi$ $= 12\pi$	A
56.	$C = 2\pi r$ $= 2 \times \pi \times 3$ $= 6\pi$ For 2 out of 3 children: $C = \frac{2}{3} \times 6\pi$ $= 12,57 \text{ cm}$	B
57.	$V = \frac{1}{2} \times b \times h \times l$ $= \left(\frac{1}{2} \times 8 \times 6 \times 14\right) \text{ cm}^3$ $= (4 \times 6 \times 14) \text{ cm}^3$ $= 336 \text{ cm}^3$	A
58.	$SA = 2\pi rh + 2\pi r^2$ $= \left(2 \times \frac{22}{7} \times 7 \times 16 + 2 \times \frac{22}{7} \times 7^2\right) \text{ cm}^2$ $= (2 \times 22 \times 16 + 2 \times 22 \times 7) \text{ cm}^2$ $= (704 + 308) \text{ cm}^2$ $= 1012 \text{ cm}^2$	D

No.	Expected answer	Option
59.	$300 \text{ ml} = 300 \text{ cm}^3$ $V = \pi r^2 h$ $300 \text{ cm}^3 = \frac{22}{7} \times r^2 \times 13 \text{ cm}$ $\frac{300 \text{ cm}^3}{13 \text{ cm}} \times \frac{7}{22} = r^2$ $\frac{1050}{143} \text{ cm}^2 = r^2$ $r = 2,71 \text{ cm}$ $d = 2 \times 2,71 \text{ cm}$ $= 5,42 \text{ cm}$	B
60.	<div style="display: flex; justify-content: space-between;"> <div style="width: 48%;"> $SA = 2(lb + bh + lh)$ $h = 140 \text{ mm} = 14 \text{ cm}$ $b = 2h$ $b = 2(14) \text{ cm} = 28 \text{ cm}$ $3640 = 2(l(28) + 28(14) + l(14))$ $3640 = 2(28l + 392 + 14l)$ $3640 = 2(42l + 392)$ $3640 = 84l + 784$ $84l = 784$ $l = 34 \text{ cm}$ </div> <div style="width: 48%; text-align: center;"> OR $\frac{3640}{2} = 28l + 392 + 14l$ $1820 - 392 = 42l$ $1428 = 42l$ $\frac{1428}{42} = l$ $34 \text{ cm} = l$ </div> </div>	C

SECTION B

Marking guideline for Section B		
<ul style="list-style-type: none"> Do not penalise the learner for the same mistake more than once. <u>There are no half marks.</u> Underline errors committed by learners do not place a cross (X). In instances where learners have used different but mathematically sound strategies to solve problems, they (learners) must be credited. Credit learners for providing the correct answer without showing calculations. 		
M	key	a mark for a correct method
A		a mark for accurate calculation
CA		a mark for consistent accuracy

No.	Expected answer	Rationale/Clarification	Mark
61.	$2y = 2x + 4$ $y = x + 2$ ✓ A y –intercept if $x = 0$ $y = 0 + 2$ $y = 2$ x –intercept if $y = 0$ $0 = x + 2$ $x = -2$  ✓CA✓CA	<p>1 mark for the standard form</p> <p>1 mark for plotting both intercepts</p> <p>1 mark for the shape/gradient</p> <p>Full marks for the correct graph plotted</p> <p>OR</p> <p>1 mark for plotting x –intercept</p> <p>1 mark for plotting y –intercept</p> <p>1 mark for the shape/gradient</p> <p>NB:</p> <p>1 mark if the learner has plotted incorrect intercepts but the gradient of the graph is positive.</p>	3

No.	Expected answer	Rationale/Clarification	Mark
62.	<p>A (1 ; 2), B (-2 ; 3) and C (-4 ; -1) A' (1 ; -2) B' (-2 ; -1) C' (-4 ; -5)</p>  <p>✓A✓A✓A</p>	<p>1 mark for correct plotting of A'.</p> <p>1 mark for correct plotting of B'.</p> <p>1 mark for correct plotting of C'.</p> <p>Full marks for the correct plotted image</p>	3
63.	<p>$\widehat{MNP} = \widehat{MPN} = 54^\circ$ ✓ M $\angle s$ opp equal sides (MN=MP) $\widehat{M} + 54^\circ + 54^\circ = 180^\circ$ sum of int $\angle s$ of Δ $\widehat{M} = 72^\circ$ CA $\widehat{M} + \widehat{Q} = 180^\circ$ co-int $\angle s$ (MN RQ) $\therefore \widehat{Q} = 108^\circ$ ✓ CA</p> <p>OR $\widehat{P}_1 = 54^\circ$ $\angle s$ opp equal sides (MN=MP) $\widehat{N}_2 = 54^\circ$ Alt $\angle s$ (NR MQ) $\therefore \widehat{Q} = 108^\circ$ ✓ CA Opp $\angle s$ of gram</p> <p>In ΔQPR $\therefore \widehat{Q} + \widehat{R}_2 + \widehat{P}_3 = 180^\circ$ sum of int $\angle s$ of Δ But $\widehat{R}_2 = \widehat{P}_3$ $\angle s$ opp equal sides (PQ=RQ) $108^\circ + 2\widehat{P}_3 = 180^\circ$ $2\widehat{P}_3 = 72^\circ$ $\widehat{P}_3 = 36^\circ$ ✓ CA</p> <p>$\widehat{P}_1 + y + \widehat{P}_3 = 180^\circ$ but $\widehat{P}_1 = 54^\circ$ $\angle s$ opp equal sides (MN=MP) $54^\circ + y + 36^\circ = 180^\circ$ $\angle s$ on a straight line $y = 90^\circ$ ✓ CA</p> <p>OR $\widehat{P}_1 = \widehat{N}_2 = 54^\circ$... alt $\angle s$ (NR MQ) $\widehat{P}_3 = \widehat{R}_1 = 36^\circ$... alt $\angle s$ (NR MQ)</p>	<p>1 mark for statement and reason</p> <p>1 mark for \widehat{Q}</p> <p>OR</p> <p>1 mark for \widehat{Q}</p> <p>1 mark for \widehat{P}_3</p> <p>1 mark for y</p> <p>1 mark for \widehat{N}_2 1 mark for \widehat{R}_1</p>	

No.	Expected answer	Rationale/Clarification	Mark
	<p>In $\triangle NPR$ $y + \hat{N}_2 + \hat{R}_1 = 180^\circ$... sum of int \angles of \triangle $y + 54^\circ + 36^\circ = 180^\circ$ $y = 90^\circ$ ✓ CA</p>	<p>1 mark for y</p> <p>Full marks for answer only.</p>	4

64.	<p>Angle at B + $45^\circ + 45^\circ = 180^\circ$ \therefore Angle at B = 90° ✓ A $AB^2 = (\text{Home to A})^2 - (\text{Home to B})^2$... Theorem of Pyth ✓ M $= (2 \text{ km})^2 - (1 \text{ km})^2$ $= 4 \text{ km}^2 - 1 \text{ km}^2$ $= 3 \text{ km}^2$ $AB = \sqrt{3 \text{ km}^2}$ $= 1,7 \text{ km}$ Angle at the shop = angle at school given $= 45^\circ$ B to school = B to shop ... sides opp. equal \angles $= 3 \text{ km}$ ✓ A $(\text{Shop to school})^2 = (\text{B to shop})^2 + (\text{B to school})^2$...Theorem of Pyth $= (3 \text{ km})^2 + (3 \text{ km})^2$ $= 9 \text{ km}^2 + 9 \text{ km}^2$ $= 18 \text{ km}^2$ Shop to school = $\sqrt{18 \text{ km}^2}$ $= 4,2 \text{ km}$ $(\text{School to Home})^2 = (\text{Home to B})^2 + (\text{B to school})^2$ Theorem of Pyth $= (1 \text{ km})^2 + (3 \text{ km})^2$ $= 1 \text{ km}^2 + 9 \text{ km}^2$ $= 10 \text{ km}^2$ School to home = $\sqrt{10 \text{ km}^2}$ $= 3,2 \text{ km}$ ✓ CA The total distance = $2 \text{ km} + 1,7 \text{ km} + 3 \text{ km} + 4,2 \text{ km} + 3,2 \text{ km}$ $= 14,1 \text{ km}$ ✓ CA</p>	<p>1 mark for angle at B</p> <p>1 mark for statement and reason</p> <p>1 mark for distance from B to the school</p> <p>1 mark for distance from school to home</p> <p>1 mark for the answer</p> <p>Full marks for answer only.</p>	5
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